Railway Mechanical Engineer

December 1942

FOUNDED IN 1832

Merry Christmas

...from the officers
and employees of the
Unit Truck Corporation

UNIT TRUCK CORPORATION

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RAILWAY
MECHANICAL ENGINEER

Railroads' Use of

Flame Hardening Processes*

Part I

By F. C. Haase†

Improvements in methods since the last war has increased usefulness of flame-hardening —Standard equipment available for most applications— Procedures must be adapted to the demands of the job

During the first World War, one important factor recognized by our industrial leaders was the need for improved methods and the new equipment and materials to meet the demands of mass production. As a result of this need, each succeeding year since then has seen more developments and inventions in all branches of industry than had occurred in any other period in the past.

The high standards that are attained today in mass production of materials, with respect to the physical, chemical, and dimensional tolerances that were undreamed of years ago, would hardly have been possible without the development of alloy steels and methods for heat-treatment. The usual heat-treating processes involved casehardening, with water, oil or air quenchin, and each process imparted to the steel definite improved physical values accompanied, however, by the natural distortion of the piece and often with residual quenching stresses left within it. For many parts this condition was unsatisfactory, with the result that the hardness would have to be drawn back to 250 to 300 Brinell, so that the part or area could be machined after treating without making it necessary to resort to the more expensive method of finishing by grinding.

Eventually the problem had to be faced and in 1925 work was undertaken to develop an oxy-acetylene process that would make possible the heat-treatment of parts that could not be handled satisfactorily by the usual processes, because of the size of the parts, distortion, or unsatisfactory wear or impact resistance obtainable with a hardness of only 250 to 300 Brinell.

Early History of Flame-Hardening

A process of flame-hardening was at that time in use in England by the Metropolitan Vickers Company and the Patent Gear Hardening Company. The process was distinctly radical and definitely successful. Development of this process was hindered at the outset by the general lack of suitable water-cooled apparatus capable of maintaining broad areas of stable oxy-acetylene flames in close contact with heated metal. Because of this lack only limited use was made of the heat of a single oxy-acetylene flame for treating restricted surface areas.

In this country the introduction of rail-end hardening to reduce rail-joint maintenance in 1927, and the subsequent widespread adoption of this process as a routine maintenance operation by many railroads, marked the first large-scale application of flame-hardening and focused attention on the need for development of apparatus suitable for other purposes.

During the past decade, flame-hardening of gear teeth of all types has gradually become a standard operation, and an active development of the process to include the hardening of common wearing surfaces such as cams, guides, coupling boxes, pulley sheaves, roll wobblers, ball and roller races, crankshaft journals, and cylinder liners has made substantial progress.

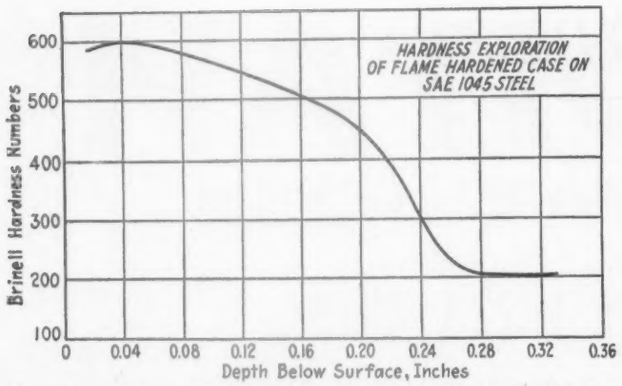
In the railroad field active development has been going on since 1939. Work was started in this field only after it was determined that apparatus and technique had been developed to a point of satisfactory flexibility and standardization.

The Effect of Flame-Hardening on Steel

Flame-hardening must be differentiated from casehardening, carburizing, nitriding, or any other practice that involves a chemical change in the surface of the material. The flame-hardening process does not alter the chemical composition. When the process was first introduced, the impression arose that the excess acetylene flame added carbon to the steel, but this is not always true. A strictly neutral oxy-acetylene flame is used as a heating medium and the hardness is produced by quenching while the surface of the steel is still above the critical temperature. The intensity of the oxy-acetylene flame induces heat so rapidly that it penetrates the material only a fraction of an inch. This imparts to the surface of the metal a hardened case which may vary in depth from a mere "skin" to ¼ in., depending on the composition of the base metal, on the operating methods used, the length of heating time, the quenching media used, and similar factors.

* Paper read before meeting of Southern and Southwestern Railway Club, Atlanta, Ga., September 17, 1942.

† General manager, The Oxweld Railroad Service Company, Chicago.



Illustrating the hardness obtainable in flame-hardening S.A.E. 1045 steel

When steel is heated above its upper critical point, the carbon is brought into a state of solid solution with the iron, or, in other words, carbon is diffused uniformly throughout the mass. If the heated mass is then allowed to cool gradually to room temperature, the carbon is precipitated to the grain boundaries, producing a coarse-grained structure which is relatively soft.

When the cooling is rapid or sudden, as in the flame-hardening process, the constituents have not time to come out of solution and the structure that results from the heating is stabilized and arrested. Thus a hard or martensitic structure is formed at the surface. There is no sudden change in chemical analysis and also no sharp line of demarcation between the hardened zone and the softer core such as is found in casehardened work. This fact is due to the balancing or tempering action of the metal beneath the hardened surface, which produces a gradual transition from the hard martensitic structure at the surface to troostite, then sorbite, and finally to the original unaffected structure of the core. The increased toughness resulting from this physical condition, combined with the higher Brinell hardness, accounts for the successful wear resistance of parts that have been given this treatment. The hardness zone produced is at least two or three times the depth of that obtained by carburizing, and will not spall, check, or crack with impact, vibration, or deformation.

Since there is no hardening deeper than from $\frac{1}{16}$ in. to $\frac{3}{8}$ in. below the surface being treated, the balance of the metal will be in a soft annealed condition with a minimum of accompanying stresses. This accounts for the fact that there are practically no failures in the service of flame-hardened parts, whereas fully 80 per cent of the failures of work hardened by other methods are breakages caused by residual quenching stresses. It is generally desirable to give flame-hardened parts a low drawing treatment of 400 deg.

Types of Heating Heads

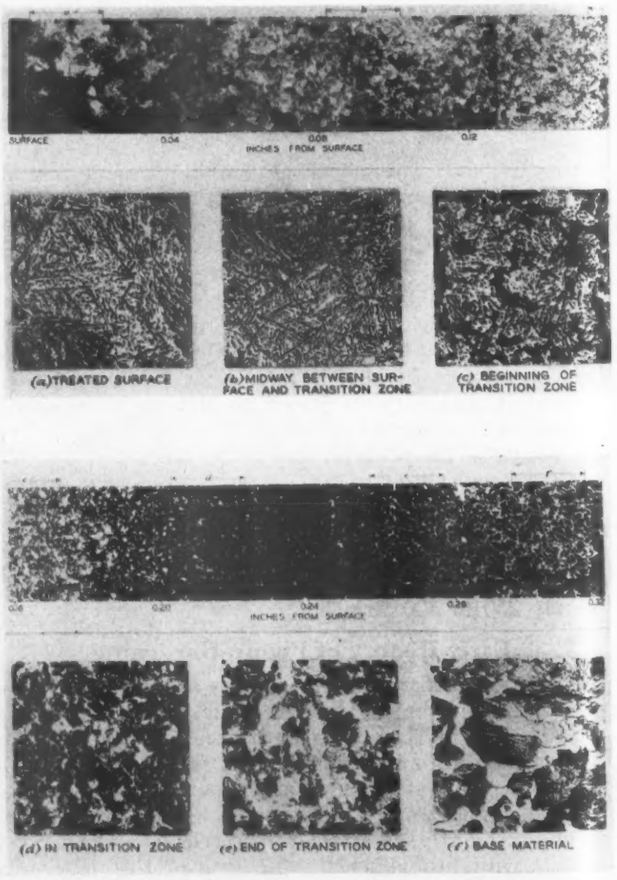
There are certain standard heating heads as well as special hardening heads which can be made. Most of the work encountered in railroad shops uses one of three types of standard hardening heads. Two of these heads are suitable for most of the applications encountered. The larger of the two will cover an area 4 in. wide and is rhomboid in shape so that a number of the heads can be grouped to cover areas wider than 4 in. The smaller of the two heads is made to cover an area $1\frac{1}{2}$ in. wide. Each of these types of head is water cooled.

The larger head has outlets for 30 small screw-in type tips; the smaller head has outlets for seven of the same type. These tips vary in length from $\frac{9}{16}$ in. to $1\frac{7}{16}$ in.; and in orifice dimensions from No. 65 drill size to No. 50 drill size. The tips can be grouped in the head to conform to the many different shapes and sizes of the various objects to be treated. By placing the short tips at the center of the head and the long tips at the edges, the flame contour can be made to fit a curved surface to be hardened on an engine or trailer rocker casting. As an alternative, if the long tips are placed at the center and the short tips at the edges of the head, the flame contour can be made to fit a concave surface such as that at the bottom seat on both the engine and trailer truck rockers. Orifice sizes in the tips vary so that the heat intensity of the flames can be adjusted for different classes of work, such as adjacent thick and thin sections. Small copper plugs are also furnished for the 30-flame and 7-flame heads, so that sections of the head can be blanked out in order to accommodate the flame width to the area to be covered.

Water for the cooling of the heads is brought to the heads through a $\frac{1}{4}$-in. O.D. copper tube. The water circulates through the hollow heads and is exhausted through a suitable outlet connection at the top.

Quenching Heads

The water-quench heads used in conjunction with the flame-hardening heads are merely brass blocks with two rows of No. 60 drill size orifices on $\frac{1}{8}$-in. centers drilled in them. The orifices are made in a staggered pattern to provide an almost solid sheet of quench water. The quenching heads are connected directly to the water outlet of the hardening head and are placed immediately



Photomicrographs of a cross-section of flame hardened S.A.E. 1035 steel showing the improved structure obtained

adjacent to the hardening head. The water jets strike the metal surface approximately ¾ in. or ½ in. away from the last row of heating flames. The water outlets are drilled at an angle, so that the jet of water striking the metal surface will not bounce back into the flame and cause interference.

Heads for Flame-Hardening Gears

There are three sizes of standard gear-hardening heads. These are made in pairs, so that both sides of a gear tooth can be treated simultaneously. In these heads the flame and quench-water orifices are drilled to the required size and spacing, and no screw-in tips are used. These heads also are watercooled.

The three heads, the 30-flame, 7-flame, and gear-hardening head, have been found entirely satisfactory for railroad work where the flame-hardening applications have been of large variety and of relatively small quantity. In industrial applications on repetitive work it is economical to use special heads for each application. This is possible because of the infrequent setup changes. In railroad work where, for instance, it may be necessary to change from hardening locomotive guides to stoker screws several times during the course of the working day, heads of suitable flexibility are necessary.

There have been certain applications, however, that require special heads. This is necessary mainly because of the space-clearance requirements in the areas to be hardened. Special heads have been made, for instance, to fit piston-head ring grooves, so that all the grooves can be hardened with one revolution of the piston head; for multiple wear guides, so that all sides of the various wearing surfaces can be hardened; and for valve-link grooves, in order to harden both sides of the guiding groove in a locomotive link. Other special heads can be manufactured for special operations, if the application warrants.

Flame-Hardening Methods

There are four different ways of flame-hardening. These are, stationary, progressive, spinning, and combination.

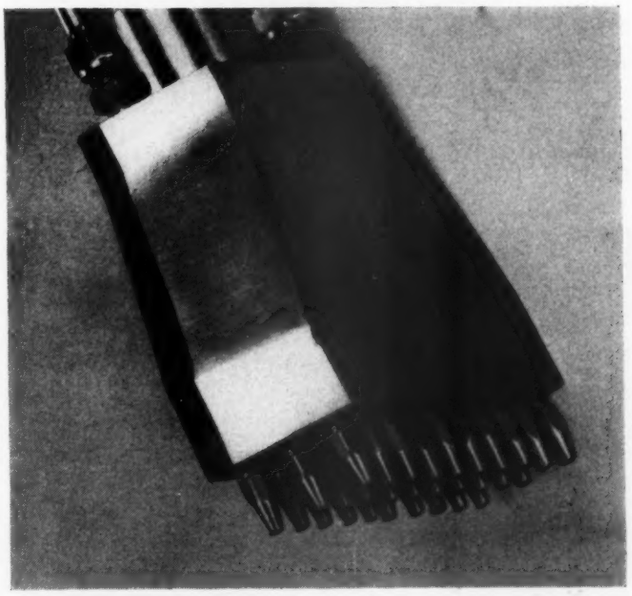
Where limited areas of the part are to be treated, the area can be heated above the critical temperature by application of heat from a standard welding blowpipe, the entire area being brought to the correct heat by manipulating the blowpipe back and forth across the surface. The blowpipe is then removed and the surface is quenched with water, or compressed air, or immersed in oil as may be required by the particular composition of the material. Extensive use is made of this stationary method in the hardening of rail ends. An area the width of the running surface of the rail and a few inches long at either side of the joint is heated in less than a minute with suitable tips to a hardening temperature. No quenching medium of any kind is used other than the atmosphere and the natural quenching action of the relatively cooler adjacent rail metal. With such treatment a Brinell hardness of from 365 to 375 is obtained, and after a few weeks of cold-rolling under traffic, the hardness will increase to about 400 Brinell. The hardness thus produced resists the battering action of wheels at the rail joint which otherwise would rapidly wear the rail section at this point.

Progressive Method

The progressive method of flame-hardening is the one most generally used in railroad shops. It is done either manually or mechanically. The mechanical method is much to be preferred because in this procedure the distance between the flame end and the work, as well as the speed of travel, must be held constant and it is practically impossible to produce uniform results manually.

The progressive method is used for operations where the blowpipe and work move with respect to each other. This may be accomplished by moving the hardening heads over the material to be hardened, as for instance when a crosshead guide is hardened, or by moving the work past a stationary hardening head, as is done when the ring grooves of a piston head are hardened.

To move the hardening heads, any type of positive reliable motive power can be used. In many railroad in-



The 30-flame oxy-acetylene flame-hardening head can be adapted for use on many types of flat and curved surfaces

stallations the equipment is mounted on a small portable cutting-machine carriage. A new type of carriage has been introduced recently which can be economically made in the shop and which is more satisfactory and accurate than the portable cutting-machine carriage. Special adaptations of old planers, lathes, and other similar equipment are satisfactory for progressive flame-hardening setups.

When flame-hardening a plane surface, the lighted oxy-acetylene blowpipe, with a flame-hardening head having sufficient flame area to cover the path to be hardened, is directed across the surface to be hardened at the maximum speed which will heat the steel to a hardening temperature. The blowpipe head is placed so that the tips of the inner cones of the oxy-acetylene flames are 1/16 in. to ⅛ in. from the surface being hardened. A stream or spray of water, which progressively quenches the heated surface, is directed immediately behind the flame.

The speed of flame travel is determined by operating variables, such as flame intensity, the type of the steel being treated, the temperature desired, and the depth of case desired. The speed may vary from 4 in. to 10 in. per minute, although the usual speed is between 6 in. and 8 in. per minute.

Flame-Hardening Cylindrical Surfaces

On cylindrical parts, one or more of four general procedures are followed, the band progressive, the spiral-band progressive, the band spinning, and the progressive

spinning methods. All four are applicable to hardening either external or internal cylindrical surfaces, continuously or in localized bands. The method chosen for a particular job depends on the nature of the work and the facilities available. The most uniform hardness is produced by the spinning methods, which are usually the most satisfactory.

Essentially the two progressive methods are direct adaptations to circular work of the technique applied in progressive hardening of flat surfaces; the work is rotated slowly past the heating flame and quench jets. In the spinning technique, on the other hand, the work is revolved at fairly high speed before the flames so that the entire circumferential area is heated before quenching takes place. The advantage of spinning is that it does not leave soft zones.

Band Progressive Method

Large-diameter cylinders, rolls, shafts, pins, and other cylindrical parts, over 4 in. in diameter, can be flame-hardened by the band progressive method. The work is

The water-quench head follows the heating head and floods the hot surface with quenching water—The hardening of the bearing surfaces on two truck equalizers is shown

usually mounted on a lathe or another machine which can be geared to rotate the work at speeds of from 3 to 10 surface in. per min. The flame-hardening apparatus is then mounted on the lathe-carriage tool post or a similar mount capable of lateral movement parallel to the axis of rotation of the work. The multiflame heating head used for this work should be water cooled and may have a built-in set of water jets for the quench, or it can be followed closely by a separate quenching head or stream. Hardening is accomplished by rotating the work past the flames at a peripheral surface speed which may range from 3 in. per min. to 6 in. per min. These figures are subject to some variation, depending on the thickness and the chemical analysis of the material to be hardened.

Upon the completion of one revolution of the circular object, the flames are extinguished and the flame-hardening head is shifted to a new position for hardening the next adjacent band. A narrow space of ⅛ in. to ¼ in. should be left between head positions to allow for heat conduction outside the flame-swept zone. As additional precautions against overlapping or reheating of the hardened bands, extra quench jets should be provided at both ends of the heating head, and in some work, an auxiliary cooling flow of water may be directed at the adjacent zones to prevent softening. These water streams should be held as close to the flames as possible.

The band progressive method is generally used where it is not essential that the hardness be consistently uniform over the entire length and on parts with such extremely large diameters that it would be economically or physically impracticable to employ the spinning method.

Spiral-Band Progressive Method

While the band progressive method is suitable for flame-hardening either localized bands, such as bearing surfaces, or for treating the entire length of a large-diameter shaft, the spiral-band progressive method is somewhat better suited for hardening long cylindrical surfaces of 4-in. dia. and larger. In this method, as the work revolves, the flame-hardening head is moved laterally at such speed as to move one head width along a line parallel to the axis of the work with each complete revolution, thus heating a continuous spiral band, and covering the entire surface of the work in one continuous treatment.

The same precautions against overlaps and edge-zone softening should be observed as in the band progressive method. In addition, a separate water quench should be provided at the ends of the work to prevent overheating or burning of the edges as the flames start and finish the spiral. The advantage in this technique is the avoidance of soft end zones, which may occur at the starting-stopping point of each band in the band progressive method.

Band Spinning Method

For hardening comparatively narrow bands of complete circumference, the band spinning method produces far better results than the progressive method, principally because it leaves no soft zones. It is best applied to cylindrical objects up to 3 in. in diameter. There are no overlaps or soft zones, and the uniform, overall heating before quenching permits hardening to any depth.

A broad flame-hardening head of the width of the band to be hardened is employed. The quench may be incorporated in the heating head, or it may be separate from it. With either type of head the heating and the quenching are separate, successive operations. The work is mounted in a spindle or lathe and revolved at a speed of 1,000 surface in. per min. The flames are allowed to impinge upon the work for only a brief period, usually less than one minute, and often as little as 10 seconds on parts of small diameter. With the extinguishing of the flames, the quenching jets are turned on and allowed to play upon the spinning part until it is fully cooled.

Two or more heating heads may be used on parts of larger diameter to assure a shorter heating time and thereby obtain the desired surface hardening effect with only shallow penetration of the heat.

The speed of the process lends itself to automatic coordination and control. If the parts to be hardened are small, they may be released automatically from the spindle and dropped into a quenching bath, rather than using specifically located quenching jets.

Progressive Spinning Method

For flame-hardening long cylinders, shafts, piston rods, and similar objects, the progressive spinning method is better than any of the methods described previously. This method is rapid and leaves no side or end zone overlaps because it is a continuous heating and quenching process that progresses uninterruptedly from end to end of the

(Continued on page 518)

Pressed Steel Builds

New York Central Coaches

THE New York Central recently placed in service 25 passenger coaches which were built by the Pressed Steel Car Company, Inc. These cars are the last of the 95 coaches, orders for which were placed with three builders during 1941. Those built by the Pullman-Standard Car Manufacturing Company and the American Car and Foundry Company are similar both in body construction and decorations. The coaches built by Pressed Steel differ from the others both in construction and decorations. The floor plans of all of the cars, however, are similar in arrangement.

Car bodies of riveted girder construction; the underframes of welded construction with cast-steel platforms — Unique application of gunmetal mirrors and a distinctive color scheme feature the interiors

Construction Details

The car body, including all outside sheets, is primarily built of USS Cor-Ten steel. Because of the inability to obtain all of the materials contemplated, however, substitutes were found necessary in many instances which increased the weight of the car body somewhat over that originally proposed. The principal dimensions and weights of the coach are shown in the accompanying table.

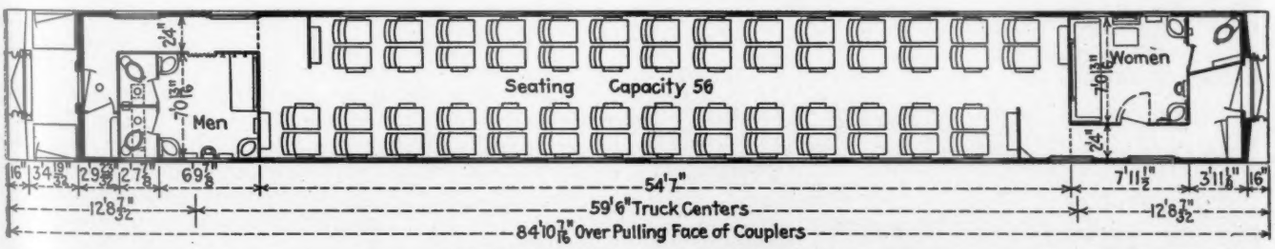
The side frame is of the girder type of riveted construction, while the underframe—i. e., the bolsters, cross-bearers, and center sills—are of welded construction. The ends of the cars are equipped with a General Steel Castings cast-steel platform and center-sill casting, welded to the center sills. The center sills consist of two A. A. R. Z-sections, 31.3 lb. per ft., with the top flanges connected by a continuous weld. The cars are equipped with the Waughmat twin-cushion type draft gear, cast-steel yokes and National A. A. R. tight-lock couplers.

The folding steps and vestibule trap doors were furnished by O. M. Edwards, and Morton Kass chrome-steel treads are applied on the steps. The cars are arranged for end closure and have Morton vestibule diaphragms.

The car is insulated with Fiberglas at the sides, ends, floor, and roof. The floor is of the Keystone type, of galvanized steel, with Tuco lightweight composition flooring applied on top. The cooling unit of the electric water cooler is located above the ceiling in the women's

Principal Dimensions and Weights of the New York Centra Coaches Built by the Pressed Steel Car Company, Inc.

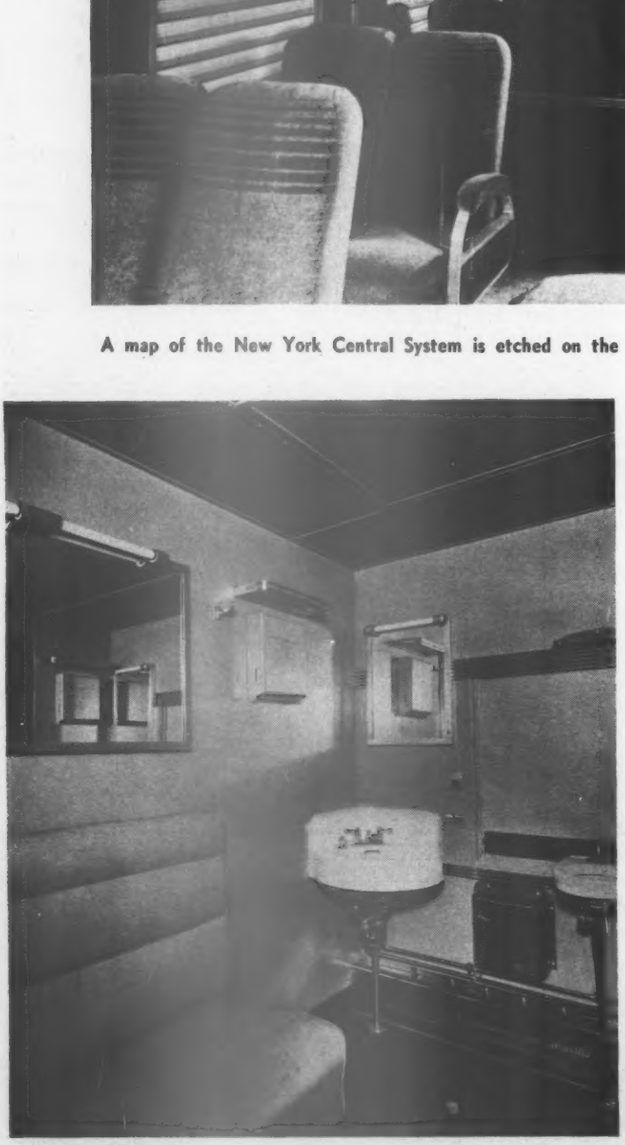
Total length over face plates coupled, ft.-in.	84–10–7/16
Center to center of trucks, ft.-in.	59–6
Height of rail to top of carline, ft.-in.	13–6
Width over side sill, ft.-in.	10–0
Weight of car body, lb.	93,280
Weight of two four-wheel trucks, lb.	39,902
Total weight, lb.	133,200
Seating capacity	56



Floor plan of the New York Central coaches

New York Central coach built by the Pressed Steel Car Company

A map of the New York Central System is etched on the gunmetal mirror at the end of the passenger compartment



In the men's lounge

lounge. The fount is located on the passageway side of the separating bulkhead at the women's end of the car.

Lighting Equipment

The lighting genemotor consists of a Safety Car Heating & Lighting Company 20-kw., 80-volt generator and a 15-hp., 220-volt, three-phase induction motor assembled as one unit and mounted on the car body, using resilient mountings designed for a proper weight distribution. The genemotor is driven by a Spicer mechanical drive with automatic clutch. Plug receptacles are located on each side of the car for providing a.c. current to the three-phase motor from standby service for the operation of the air-conditioning unit at terminals and stations.

The genemotor regulating apparatus consists of a Safety Car Heating & Lighting Company generator regulator, automatic switch relay, and lamp regulator. The lamp regulator is set at 60 volts at the center of the lamp load.

General illumination is supplied by one 40-watt magnifying lens type lighting unit over each seat. Translucent plastic oval-shaped louvers in the space between the lenses give the appearance of continuous fluorescent lighting fixtures. The plastic louvers are lighted when the main lights are turned off by a 10-watt blue night bulb located midway between the lens type units. On the vestibule platform, in the passageways, toilets, and lounge rooms are individual lamp fixtures. Thirty-two cell, 600-amp. Gould storage batteries are used.

Air Conditioning

The Frigidaire electro-mechanical air-conditioning apparatus is of seven tons' capacity. It consists of a compressor-condenser unit located below the car floor and the air-conditioning unit above the ceiling of the men's lounge.

The insulated air duct in the center line of the ceiling of the passenger compartment is divided into a pressure and a diffusion duct, with pressure at the top and diffusion below. For convenience in cleaning the lower panels of the ducts are hinged full length.

The floor-heat is provided by fin-tube radiation with

Vapor-type thermostatic control. The train line consists of 2⅞-in. outside-diameter seamless-steel tubing, with Wovenstone insulation on all steam pipes, Vapor end valves, and couplers with Vapor horizontal type insulated steamheat connections.

Air Brakes

The cars are equipped with the New York Air Brake Schedule HSC brakes with D-22-AR control valves, and two 12-in. by 10-in. cylinders mounted on each truck, with an automatic slack adjuster for each cylinder. The hand brake, at the platform end, is the National Peacock No. 800-L type connected to brake shoes on both sides of the truck at that end of the car.

Trucks

The trucks are of the General Steel Castings single-equalizer type with bolster anchors in lieu of chafing plates. They have a 9-ft. wheel base and are fitted with Simplex clasp brakes. The bolster springs as well as the equalizer springs are of the coil type furnished by the Crucible Steel Company. The greater deflection of the coil bolster springs effects smoother riding at high speeds. The action of the bolster springs is controlled by Monroe one-way shock absorbers. The axles, which are of the latest A. A. R. design, are arranged for the application of 5½-in. by 10-in. Timken roller bearings. The trucks have Armco 36-in. diameter wrought-steel wheels with 11-in. hubs. They are fitted with Miner roller side bearings. The truck center pins are the Miner locking type.

Between the body center plate and body bolster is a sound-deadening rubber cushion which covers the entire center-plate base. Between the truck and body center plate is a manganese-steel wear plate, and a Fabreeka sound-insulation filler under the truck center plate.

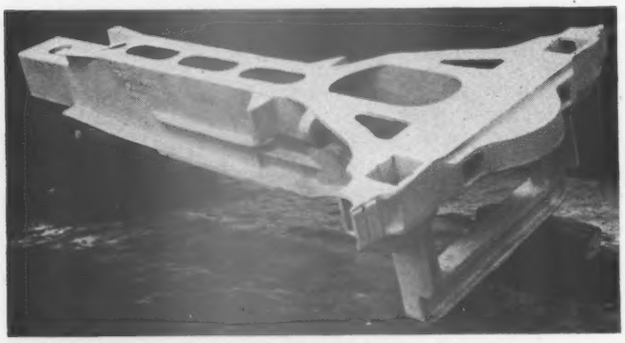
Interior Equipment and Decoration

The interior decoration and color schemes for the Pressed Steel coaches were developed by the builder with Lurelle Guild, industrial designer, New York.

Looking into the coach from the corridor opposite the women's lounge

Interior of one of the New York Central Coaches—The upholstery is blue green; the ceilings, bone white with satin-finish metal mouldings—The pilaster mirrors are gunmetal

In the main compartment of each coach are double-rotating, reclining seats furnished by the Transportation Seat Company. The seats have foam rubber cushions and folding footrests. They are upholstered in Chase two-tone striped blue-green mohair. The floor underneath the seats is covered with black Marbelle linoleum and between the seats with gray-white Marbelle. These black and gray coverings terminate at the linoleum inlaid strips in the center of the aisle. The wainscoting



The steel platform and center-sill casting includes the draft-gear pocket, center sills, body-bolster spacer, coupler carrier, and buffer beam

from the top of the heater guard to the window sill is painted blue-green to match the seat covering. The space above the window header to the top of the molding underneath the continuous basket rack is painted aluminum; the ceiling above the molding is bone white. The window sills are sloped.

The pier panels between the window openings from the sill to the window header are covered with gunmetal mirrors surrounded by gunmetal-colored moldings, and on each of the bulkheads at the ends of the passenger compartment, from a height in line with the top of the window sill to the top of the basket rack, is a full-size gunmetal mirror. On this appears a map of the New York Central System showing the principal lines and larger cities. The upper portion of the full-height bulkhead between the end seat and passageway at each end of the car is of etched Herculite glass.

Variegated colors, which harmonize with the color scheme of the interior of the main passenger compartment, give the interior face of the Pantasote shades the appearance of Venetian blinds.

The exterior face of the shades is green. They are operated by cable fixtures furnished by Adams & Westlake.

The window sash are stationary and consist of Adams & Westlake double-glazed dehydrated units having ¼-in. polished plate glass on the outside and ¼-in. laminated safety glass on the inside, removable from the inside of the car. The continuous built-in basket racks have a specially designed louvered arrangement which allows vision into the racks when placing baggage in them but which conceal their contents from seated passengers.

The tops of the baggage racks are covered with chrome steel cut out for the insertion of the louvers.

The moldings below the window sills, above the window header, on the basket-rack front, and the center moldings at the bottom of the air duct are of satin-finish chrome steel. The moldings at the basket-rack front and at the window sills are continued on the bulkheads at the ends of the passenger compartment above and below the large gunmetal map mirrors.

Both sides of the passageway, at each end of the car, including the women's lounge-room door, are covered with Linowall to the height of the window header. This material resists marring or damage by hand luggage.

The coaches have a vestibule platform at one end only. The men's lounge at the vestibule end has a floor covering of blue Jaspe linoleum cut diagonally from the corners of the room to the center. The edges of the linoleum terminate in a 4-in. black rubber cove molding. The walls and ceilings of the lounge are periwinkle blue. The two-passenger settee is upholstered in Chase Redo. The lounge is equipped with one dental bowl and three white enamel lavatories. Over each of the lavatories is a 110-volt receptacle for electric razors. There are mirrors with 12-in. Lumiline lamps over each lavatory and over the settee. On the door to each of the two toilet annexes are full-length mirrors, and at the entrance to the lounge is a portiere.

The women's lounge and toilet are at the stub end of the car. The flooring of this lounge is covered with eggplant linoleum, the edges of which also terminate in a 4-in. black rubber cove molding. The walls and ceilings are semi-gloss peach bloom. The equipment in the lounge includes a full-length sofa covered with Chase fabric plush of a color to harmonize with the interior painting; a dresser with a vanity chair; two white enamel lavatories; a dental bowl, and mirrors with lighting fixtures of the same design as in the men's lounge. The door to the toilet annex has a full-length mirror. At the entrance to the women's lounge is a door and a semi-circular portiere.

The water-pressure system has a 200-gal. tank and furnishes hot and cold water to the lavatories.

Railroads' Use of Flame-Hardening Processes

(*Continued from page 514*)

workpiece. The applications of this technique are limited only by the size of the work and the investment in equipment which this justifies.

As in band spinning, the workpiece is revolved at a speed of about 1,000 surface in. per min. Flame-hardening heads for this application are usually ring shaped to fit around the workpiece. For the larger diameters, they are composed of segments, each usually served from a separate supply of oxygen and acetylene. The heads are mounted on a suitable carriage to provide lateral motion of from 3 in. to 10 in. per minute and are followed closely by a similarly constructed quench ring containing water jets. The rate of forward travel depends on the hardness depth desired and is further affected, somewhat, by the thickness of the part, since a larger mass of metal will require a slower speed for adequate heating.

Because of the high rate of heat conduction into the base metal, it is often necessary in progressive spinning to provide auxiliary cooling jet rings ahead of and behind the heating heads. The forward quench prevents withdrawal of heat from the heated zone in advance of the flames. The trailing quench serves to prevent heat build-up behind the quench, which might cause a drawing action in the hardened metal. An internal quench ring prevents excessive heat penetration on hollow parts.

The application of flame-hardening to a particular piece of work may be done in a number of ways, as is evident from the various techniques described. Which one to use for a particular job is determined, not only by the degree of hardness desired, but by economic factors as well. Within certain limits, all methods produce satisfactory flame-hardening, but each has advantages for specific jobs.

(*This paper will be concluded in the January issue*)

Methods of Systematic

Treatment of Feedwater*

Karmen-Winger Studios

J. P. Powers,
Chairman

A review of various types of treatment—Blow-down equipment and procedures of road and terminal blowing discussed

WATER treatment has done so much for the railroads in the reduction of boiler work that it is of never ending interest to the boiler makers. It is with considerable pride that we can show that, during all the years when our trade was losing a large amount of work due to the results of water treatment, we always supported the water-treatment work and urged the extension of this program wherever possible. We can justifiably claim some of the credit for the beneficial results obtained and take particular pride in our part in the improved performance which is so important to our country and to our railroads at this time.

The Methods of Water Treatment

There are a number of ways to handle water treatment and the selection of any particular method at a certain location or in a certain district is determined by the character of the water and the rate of consumption. The recognized methods are: (1) Lime, soda-ash, sodium-aluminate treatment; (2) wayside application of internal treatment; (3) exchanger process treatment; (4) boiler compound.

The first two methods are most prevalent in the United States and the choice is largely a matter of economics. The lime, soda-ash and sodium aluminate treatment is essentially a complete external cold-process treatment that can reduce the hardness of boiler water to approximately one grain and provide a good clear boiler water with reasonable excess alkalinity. This treatment is usually followed up with some type of after treatment to control after precipitation and provide protective materials in the boiler water for the prevention of pitting or corrosion in the boilers. These materials are also recommended for the prevention of intercrystaline cracking as covered by previous reports to this association. This method of treatment provides excellent results and, wherever the character of the water together with the amount of water consumed, warrants the relatively large plant investment, the railroads get adequate return on their investment in improved boiler performance.

Many installations have such water of such low hardness or deliver such small quantities of water that it is more economical to provide for the so-called wayside type of treating plant. This method provides means for introducing chemical to the wayside water supplies either on the way to the storage tanks or into the water on its way to the locomotive tender. Existing water pumping and storage facilities are usually not disturbed. The installations are made with low capital expenditure and the results obtained are considered to be comparable with the lime-soda method.

The exchanger type of treatment is used in certain cases where the character of the raw water supplies permits. The ordinary salt regenerated type may be used where the alkalinity ratio of the product water is satisfactory. There are some locations where this type of equipment can be used, but its application is limited.

More recent developments in this type of equipment

Dearborn Concentrometer—An a.c. electric conductivity measuring instrument for the determination of total dissolved solids

* Abstract of a committee report prepared for the Master Boiler Makers' Association. The full text of the report will appear in the 1942 year book of the Association.

combining acid and salt regeneration to control the alkalinity of the product water have not found application in railroad work as yet, but we understand these are being tried.

A still more refined type of exchanger treatment consisting of two filter beds in series, one regenerated with an acid and the other regenerated with either soda ash or caustic soda, has had some applications, particularly for producing water comparable to distilled water for use in train-heating boilers. This method appears to be too expensive for general locomotive water treatment application, although it has been entirely successful in treatment of water for the train heating boilers.

With all exchanger type treatments the product water is very corrosive and correct amounts of suitable after treatment must be added if severe pitting is to be avoided. This matter is apt to be overlooked in considering these types of treatment.

Still other treatment means are to be found in the various proprietary boiler compounds that are available. Usually these are used for some special purpose such as the control of a bad foaming condition or some such unusual condition. There are conditions in certain localities that call for special treatment, but in the main water treatment of the first or second type appears to take care of the majority of the cases and the methods and treatments are pretty well standardized at this time.

Controlling the Amount of Blowdown

With any of the standard methods of treatment there are certain fundamentals that must be understood and followed in operating the locomotive boilers if maximum benefits are to be obtained from the water treatment. Boilers that are rendered scale-free due to the treatment of the water supplies are capable of greatly increased output and, furthermore, they can be kept in service much longer between boiler washes if correct control is exercised over the matter of blowdown.

With correctly treated feedwater we have a boiler water that has a certain amount of highly soluble matter and a certain amount of insoluble sludge, all in circulation. As water is continuously evaporated into steam, the soluble salts and the sludge are left behind. If nothing is done about this, the concentration keeps building up in the boiler until eventually the boiler water will foam and cause carry-over with the steam.

Equipment has been developed to determine accurately how much blowing must be done in any given district to control the build-up of concentrations within a safe maximum so that the correct amount of blowdown can be determined without wasting fuel or water by excessive blowing. Once the correct blowing schedule is determined, it must be enforced as that is one thing that needs everyone's attention. It is too easy to lapse into forgetfulness on blowdown and let the other fellow take care of it. This is particularly bad in long engine runs as any individual engineman may be able to get by with little or no blowing, but his partners on down the line have to pay the penalty for his neglect.

Fortunately, the same means that determines the correct amount of blowdown in the first place can be relied upon to keep a check on individual performance. Samples of boiler water can be taken at each terminal and a quick check in the test equipment will show up the condition of the boiler water immediately insofar as any foaming tendency is concerned. Some railroads make a practice of posting these readings, called T.D.S. readings, for total dissolved solids, on the bulletin board at each of their terminals together with the engine number and the engineer's name. A great deal of interest in the subject of blowdown is thus created with benefit to all.

National Nalcometer for the electric determination of total dissolved solids in boiler water

Equipment for making these tests is shown in illustrations. The Nalcometer and Concentrometer make use of the electrical principle and are reported to be very accurate and provide speedy means of determining T.D.S. Other equipment is available which determines the T.D.S. by the density of the solution, but these are somewhat slower than the electrical methods, although they can be used within their limitations for an indication of the amount of blowing required.

Road Blowing

Blowing is handled in many different ways depending on the requirements. Where feedwater conditions are favorable, road blowing may not be required and all blowdown can be handled at the terminals. With long runs, however, passing through many districts, it is usually desirable to have at least some of the blowing done on the road, and this may be accomplished by adhering to a schedule of blowing through hand-operated blowdown valves. The schedules are often set up to blow a certain number of seconds each 10 miles on each side.

Road blowing has the advantage of giving a good control of sludge concentrations. The circulation in a boiler is rapid enough that sludge particles are usually pretty well dispersed throughout the boiler. Therefore, blowing on the road while the sludge is in suspension will remove a proportionate amount of this sludge from the boiler for each pound of water blown out. This holds true wherever good blowing practice is followed. Of course, if blowing is neglected there will be too much sludge in the boiler for the water circulation to keep moving and that is when mud banks are formed. Mud banks can usually be prevented by proper water treatment and correct blowing procedure.

Some roads do not wish to rely on manual blowdown and prefer some automatic means. The Automatic Continuous Blowdown, furnished by the National Aluminate Corporation and Electro-matic blowdown equipment furnished by the Dearborn Chemical Company have both been used to provide automatic control of the blowdown.

Terminal Blowdowns

Regardless of the type of road blowing followed, it is probable that there will always be a need for check-up

(*Continued on page 526*)

Reducing

A Hazard of Derailments*

By L. R. Schuster†

Safety guide, developed on the Southern Pacific, functions to prevent jackknifing of derailed passenger trains by holding the cars in line with the track

In the summer of 1939 the streamliner City of San Francisco was derailed by a saboteur near Harney, Nev. This was a very disastrous wreck, causing considerable loss of life, many injuries and enormous property damage.

The circumstances surrounding this derailment, as developed by investigation, were briefly these:

The train was on a curve approaching a bridge across the Humboldt river at about 60 miles per hour when it encountered a misplaced rail. That is, the receiving end of the rail on the outside of the curve had been moved in several inches toward the center of the track and spiked there in such a way that the locomotive would be expected to derail immediately and head into the canyon.

A derailed truck of the test car showing the engagement of the rail by the safety guides

But the Diesel locomotive, while it left the rails at that point, still continued on across the bridge. The trailing cars followed the locomotive until the cars swung out of line sufficiently to contact and tear down the bridge superstructure, causing complete collapse of the bridge. It was this action that resulted in the major portion of casualties and destruction of equipment.

What kept the power units in line with the rails for such an unexpected distance beyond the point of derailment?

The answer was found in examining the trucks of the power units. Diesel-electric locomotives are provided with large traction motors on the axles which drive the train through a pinion and gear. Examination disclosed that, after derailment, the rail was engaged in a small space between the motor frame and gear case, which acted as a skid and prevented the trucks from getting out of line with the rail. Aiding in this action were the bolts and nuts securing the binder bars to the bottom of the truck pedestals. Worn and burned marks on these bolts and nuts showed that they bore against the

How the safety guides functioned on a rail which overturned

* Abstract of a paper read before the September 10, 1942, meeting of the Pacific Railway Club, at San Francisco, Calif.

† Engineer of car construction, Southern Pacific.

Application of a safety guide to the pedestal of a conventional six-wheel equalizer-type passenger truck

ball of the rail for at least part of the distance and materially assisted in keeping the locomotive parallel with the track.

The City of San Francisco derailment pointed definitely to the need for an additional safety device for trailing cars, since the performance of the power units gave an inkling of what might be developed.

We knew that the materials from which the cars were constructed were the finest obtainable. Design strength was greater than many of the heavier conventional cars and the most up-to-date safety features had been incorporated in the design. Two of these safety devices which are of particular importance in derailments are the tight-lock coupler and the bloster locking center pin. The tight-lock coupler is so designed that the knuckles will not slip by even if the cars are derailed and this is an effective safeguard against telescoping which produced disastrous results in accidents in the past. The bolster locking center pin serves to prevent the truck from coming out from under the car, which usually happened with the old type of center pin.

Tested Under Severe Conditions

Both of these devices did a very find job in the City of San Francisco derailment. The trucks of the two cars turned over down the embankment were still attached to the car bodies and the first five cars were still coupled.

It was apparent then, that if some practical means could be provided to keep trucks from sluing or turning crosswise under the car, one of the principal hazards in derailments would be very materially overcome. Such a device has now been developed and applied to a large number of cars throughout the country. This device is called a Derailment Safety Guide‡ and in the short time it has been in service has had several opportunities to prove its worth. It is simple in construction, adds very little weight to the equipment and in some applications, principally on passenger-car trucks, takes the place of the usual pedestal tie bar or binder. At its outside edge, when applied to the pedestals of outside journal boxes, is a vertical flange which is designed to extend down to a minimum distance of 4½ in. above the plane of the top of the rail when the wheels are new.

When a wheel drops to the ties and moves slightly to the side, the flange engages the ball of the rail and prevents further side movement. Its action then is to skid along the rail and keep the truck in line with the car body. It is this action that eliminates the chief cause of jackknifing with its resultant damage to equipment and increased liability of injury to passengers.

Tests of Derailment Safety Guides

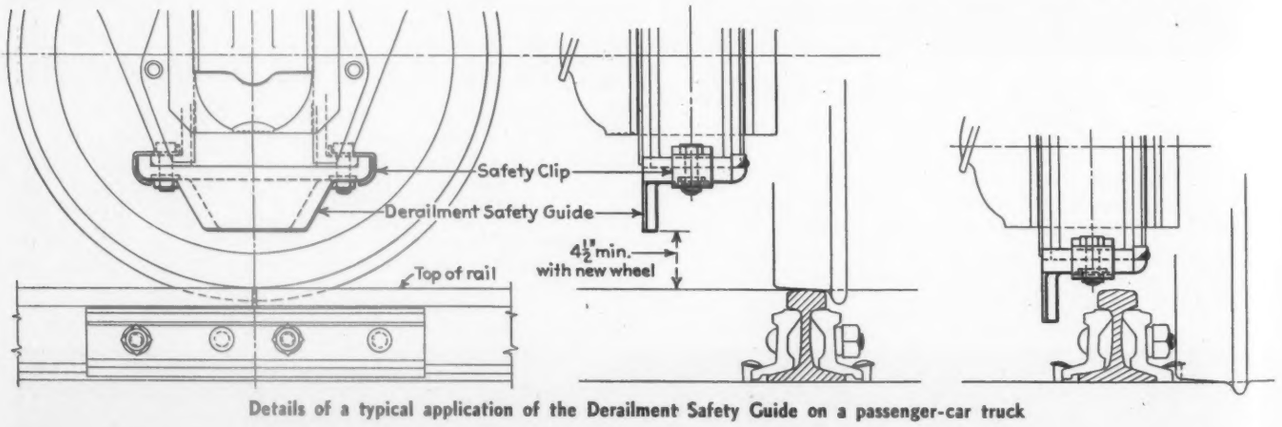
Before applying any of these safety guides to Southern Pacific cars, several tests were conducted in which the test car was actually derailed. For these tests a flat car was fitted on one end with streamline type of passenger-car truck equipped with Derailment Safety Guides and the car was partially loaded with rails to simulate service conditions. The opposite end had a standard freight-car truck.

Four tests were made in this instance at speeds of 10, 20 and 30 miles per hour and were accomplished by either pulling or kicking the car over a standard portable derailer except in the case of the third test. In this test, one end of one rail was moved six inches toward the center of the track to create a condition similar to that which derailed the streamliner City of San Francisco and the test car was kicked from the end of the train at a speed of approximately 20 miles per hour.

One of the photographs shows the derailed truck with the guide flanges firmly pressed against the rail.

Another illustration shows the position of the generator bracket on the end of the truck frame. In a derailment of this nature, brackets of this kind are very liable to contact angle bars or other track fastenings and cause the truck to slue.

The fourth test in this series was made by cutting



Details of a typical application of the Derailment Safety Guide on a passenger-car truck

‡ Patent on this device is held by George McCormick, formerly general superintendent of motive power, and B. M. Brown, general superintendent of motive power, Southern Pacific.

off the test car at a speed of approximately 30 miles per hour on a 12-deg. curve. A standard movable derailer was used and the car traveled a distance of 75 ft. after derailing. The truck equipped with derailment safety guides was held to the rail for the full distance traveled. In the photograph taken after this test note how the front truck is in line with the track while the rear truck, not equipped with the safety device, moved over until the wheels on this side were against the opposite rail. The rear wheels of the front truck did not derail although they passed over the derailer. This indicates that the safety guides on the front pair of wheels held the truck sufficiently in line to cause the rear wheels to drop back on the rails. In one of the other illustrations the generator bracket on the truck was shown. At the extreme left of this view it will be seen that one lug of this bracket is broken off due to the severity of impact during this derailment.

When we had studied and digested the evidence produced by these tests we arranged to apply derailment safety guides to all of our new type streamline cars, including the City of San Francisco. Our neighboring lines and the Pullman Company cooperated with us to the end that new Pullman cars placed in service in the Lark train as well as new Pullmans recently delivered for Overland and Golden State Limited service are equipped with this safety device.

Effects of Safety Guides in Derailments

Derailments of passenger trains are not common, due to rigid inspection and maintenance of equipment and right-of-way. But sometimes they will occur and when the streamline Lark was involved in an unfortunate rear-end collision last September we were extremely thankful that this train was completely equipped with safety guides.

The standing Lark was struck from the rear by a fast merchandise train traveling at a speed of about 22 miles per hour at the time of the impact. The rear car was pushed to one side and practically destroyed by the impact and the locomotive of the freight train hit the end of the next car. Trucks of all but the first few cars in the train were derailed and there was a marked tendency for all couplings to jackknife. The safety guides, however, lapped over the rail as these trucks were derailed and prevented the cars from jackknifing; the lateral reaction was so severe that rails were turned over under the cars. A closer view of this is shown in one illustration. It will be seen that on one truck the flange of one safety guide has lapped over the ball of the rail and the other has caught the bottom flange of the overturned rail.

Results obtained with the derailment safety guides on streamline-type passenger equipment were so successful that we have extended the application of the device to many of the conventional type of passenger cars and also to a number of locomotives and tenders. Some 860 units of rolling stock have now been equipped.

Some of the other applications to various types of equipment are illustrated. In the application to a conventional type six-wheel truck safety clips have been provided, to prevent the guide bar from dropping in event of a lost nut or broken bolt. Also shown is a lug which bears against the back of the pedestal so that when force is exerted on the vertical flange, dependence is not placed entirely on the bolts securing the guide to the pedestals. Ends of the guide are also flanged up against the pedestal.

A short time ago the engine on one of our passenger

Projections like this generator bracket tend to slew derailed trucks by contact with angle bars or other truck fastenings

trains on the Coast route ran over a piece of pipe at a crossing, which caused the engine truck to derail. The train proceeded for a distance of some 900 ft. before being brought to a stop. The usual experience with engine trucks is that they turn crosswise or head away from the track when derailed and result in the engine turning over, or other serious consequences. In this

(*Continued on page 526*)

How the test car came to rest after a derailment at 30 miles an hour on a 12-deg. curve

Factors Which Make for

More Use of Motive Power*

By J. M. Nicholson†

The author sketches the history of the development of long locomotive runs and discusses the measures which are effective in reducing out-of-service time—New power and more intensive use both required for 1943

THE utilization of locomotives is a phase of railroad operation that has been studied consistently for a considerable period of years. It has grown to major importance in the last generation, and is now a very vital subject in handling the transportation being offered to the American railroads.

In the period 1918 to 1920 the practice was inaugurated of extending locomotive runs over more than one engine crew district, giving the locomotive servicing attention at the intermediate point, and either running it through the terminal on the same train, or relaying it to the next following train. The usual practice was to give the locomotive such repairs at the turnaround terminal as were necessary to get it back to the maintenance terminal. Heavy, running repairs were handled at the maintenance terminal, which was usually on one end of the run. After a few years of this operation locomotive runs were extended over two to three or four engine-crew districts, and by 1922 runs over four engine-crew districts in passenger service and three engine-crew districts in freight service were not uncommon.

In years following, this handling was built up to where steam locomotives in passenger service were operated continuously from 1,500 to 1,800 miles, and locomotives in freight service from 500 to 800 miles. Today very few through-freight or through-passenger locomotives are operated over but one engine-crew district, and in practically all through freight and passenger service the locomotives are operated on a program of extended runs which is worked out to give maximum utilization consistent with the service to be handled and the location of the terminals where heavy maintenance is performed.

Prompt Inspection on Arrival

In order to get rapid turning of power at maintenance terminals it is necessary to have sufficient forces on the second and third shifts in the enginehouse to be able to repair and turn the power arriving on these shifts with the same regularity of turning time that is experienced on the first shift. We found it necessary in order to speed up the movement to strengthen our second and third shifts. We insist that locomotives be inspected just as soon as possible after they reach the maintenance terminal or turnaround terminal at the end of the run. In 50 per cent of the cases the locomotive is inspected within one hour after its arrival at the terminal, and only in rare exceptions is the locomotive in the terminal more than two hours before it has been inspected by the roundhouse force. By making this inspection promptly after arrival of the locomotive at the terminal the enginehouse foreman can materially reduce the terminal time by servicing and repairing the locomotives first which have the minimum work to be performed; and by furnishing these locomotives first he can hold the locomotives the necessary time that require heavier work and still furnish the power required.

The usual terminal layout in existence that was established for locomotives on short runs involved an inbound and outbound track to the enginehouse, with fuel, water, sand and fire-cleaning facilities so located that it was necessary to stop at three or four different locations in order to supply the locomotive, and for servicing the locomotive it would require approximately thirty minutes' time with such facilities. This time, along with the time required to move from the train to the roundhouse and get back from the roundhouse to the train and make the air test, in many cases was greater than the time required to switch the freight train. In order to relieve this condition, made necessary by running locomotives through terminals, and arrangement of facilities in many cases has been provided where the locomotives are supplied fuel, water, and sand, and given fire-cleaning attention at one spot, pits being provided for handling underneath inspection and replenishing of driving-box grease if necessary, with the result that the roundhouse delay for inspection and servicing is being handled in ten minutes. During this time the outbound engineman is oiling the engine around and making his inspection.

In switch service each terminal assignment is analyzed and such switch tricks as possible are grouped so that the locomotive will work three consecutive tricks before being turned into the enginehouse for repairs and servicing attention. Further analysis is made to group all of the tricks possible so that the locomotive will work two consecutive switch tricks, and such tricks as cannot be grouped are worked by turning the locomotive into the enginehouse after each trick, and after giving it necessary attention it is placed on another following switch trick.

Minimizing Out-of-Service Time

In order to get maximum utilization from locomotives it is necessary to reduce to a minimum the time of handling enginehouse maintenance, and reduce intermediate terminal servicing time as well as turnaround terminal time. It is equally as important that the time of handling classified repairs be reduced to a minimum. The usual practice prevailing for many years in the handling of classified repairs is to work back shops and general repair shops eight hours per day, and six days per week. This program has been modified at all of the

* Abstract of a paper presented before the Western Railway Club at Chicago on November 16.

† Assistant to the operating vice-president, Atchison, Topeka & Santa Fe.

Santa Fe general shops, also in many of the shops where class four or class five repairs are made, by having a second shift which carries on classified repair work 16 hours a day instead of eight hours, resulting in a very substantial decrease in out-of-service days for locomotives receiving classified repairs. We have found that second-shift operation in repair shops on classified repairs has resulted in reducing the out-of-service days approximately 40 per cent.

The activities carried on by the second shift are confined largely to the tight spots in the particular shop involved, such as stripping-gang work, boiler work, machine work, and floor work. These men on the second shift are used to expedite the particular character of work that is holding back the output of the shop, and their activities are changed to meet the particular conditions existing.

The percentage of power out of service on the Santa Fe for general repairs, consisting of class three repairs and heavier, is ranging from three to four per cent of our ownership. Locomotives out of service for class four and five repairs are also ranging from three to four per cent of the total ownership.

We have made numerous studies of the time steam freight locomotives are in service, time undergoing repairs, and time waiting for train after repairs are completed, which show for a 24-hour period an average of approximately 12 hours working, 8 hours undergoing repairs, and 4 hours waiting after repairs have been completed. On passenger locomotives the hours working and hours undergoing repairs are approximately the same as for freight service, while on switch locomotives the hours working are approximately 16 per day.

A recognized unit for measuring utilization of locomotives is the miles made per active locomotive per day or per month, which takes into consideration all active locomotives and does not include those that are stored serviceable. With present operations on most railroads, no through freight or passenger power is now stored serviceable, and this has resulted in using as a yardstick in some cases the average mileage made for all locomotives assigned for various extended locomotive runs. On this basis, all locomotives in the extended-run assignment are included regardless of whether they are in the shop for general repairs, in the roundhouse, or working.

On the basis of average miles per active locomotive per day, the Santa Fe for the month of July, 1942, averaged a total of 318 miles per day for all locomotives in passenger service, a total of 167 miles per day for all locomotives in freight service, and a total of 94 miles per day for all locomotives in switch service.

Extended Schedules on Practically all Through Runs

At the present time on the Santa Fe approximately 95 per cent of all through freight and through passenger locomotives are operated on extended locomotive run schedules over two or more engine-crew districts. In July of this year the principal classes of through-freight steam locomotives averaged 6,166 miles per locomotive for the 418 locomotives assigned. The highest mileage ran on the system in this service averaged 9,015 miles per locomotive assigned. In steam passenger service the average was 9,928 miles per locomotive for the 129 locomotives assigned, and the highest mileage made on any individual run averaged 15,382 miles during the month of July. These figures are quoted on the basis of locomotives assigned, regardless of whether they were in the shop for classified repairs, in the enginehouse for running repairs, or actually in service. The maximum mileage made by any individual steam freight locomotive was 10,397 miles during the month of July, and the maximum mileage made by any individual steam passenger locomotive during the same month was 20,290.

The Santa Fe, along with other western roads, is confronted with a problem of using as boiler water for locomotives the water which is available in this territory. The water available is considerably higher in sulphates and carbonate salts which produce scale, and also in alkali, than is water in other parts of the United States. Twenty years ago it was the practice to wash boilers after about 500 miles of service, and most of the water was treated with lime and soda ash wayside treatment. The treatment of water has been improved, and today many of these locomotives are being operated thirty days between washout periods due to the improved water treatment and the blowing out of boilers as regular intervals to relieve the concentration and sludge accumulations in the boiler. Locomotive boilers today are being operated at a higher rate of evaporation per square foot of heating surface than in former years, and with a reduced amount of foaming and priming; and this has materially reduced the time required to perform the necessary running repairs at maintenance terminals.

Another major factor contributing to improved utilization of locomotives in present-day operation is the improved lubrication of all parts of a locomotive. A higher quality of engine oil, valve oil and grease has been developed in order to meet the high-speed service that is now required. Mechanical lubrication of valves and cylinders, engine trucks, shoes and wedges, guides and trailers has contributed to reducing hot-bearing trouble enroute. It has also contributed to reduced maintenance in enginehouses for such operations as renewing cylinder packing and valve rings, rebabbitting cross heads, changing engine-truck and trailer wheels, hot driving boxes and hot pins.

Roller Bearings Reduce Maintenance Work

Roller-bearing driving boxes, engine-truck, trailer and tank boxes, have also materially reduced maintenance work on these parts. We have two Mountain-type passenger locomotives equipped with roller-bearing rods that have been in service now for about one year. Performance to date indicates that less maintenance time is required with the roller-bearing rods.

Diesel locomotives are being used in freight, passenger, and switch service to the extent of 7 per cent of the total gross ton miles for the system in freight service, 13 per cent of total car miles for the system in passenger service, and 17 per cent of the total switch locomotive miles. The average miles of Diesel freight locomotives assigned for the month of July this year amounted to 11,056 miles, for Diesel passenger locomotives 17,117 miles, and for Diesel switch locomotives 4,125 miles. Diesel switch locomotives were working 92 per cent of the hours in the month. It is the practice to give preference to the use of Diesel locomotives where both steam and Diesel locomotives are assigned, in order to get maximum utilization out of the Diesel locomotives, which results in some loss of mileage to steam locomotives with this handling.

New Power and Intensive Use Both Required

Ralph Budd made the statement predicting an increase in traffic in 1943 of 15 per cent over that for the year 1942, and it was his judgment that the railroads would require 1,000 more locomotives and 100,000 more freight cars in order to handle this increased traffic safely.

One thousand more locomotives, divided between passenger, freight, and switch in present ratio, would mean an increase in ownership of between 2½ and 3 per cent. These locomotives would be of the latest type and it would be safe to assume that they should handle between 1½ and 2 times the amount of tonnage of the average locomotives now owned in freight service, so that this relief would probably take care of from 4 to 6 per cent of this increase in traffic. The remainder would have to be taken up by more intensive utilization of present locomotives. This would mean that the locomotives must be utilized more intensively, handled to and from roundhouse promptly at intermediate terminals, and the time for servicing at roundhouses and repairs in back shops would have to be further reduced.

Utilization of locomotives as measured by total miles per locomotive month, or by hours worked per month, at the present time is the greatest that has ever been secured, and the study being given improved utilization is greater than it has ever been. This in part is due to critical material not being available to secure new steam or new Diesel locomotives readily, and also due to a large part of the locomotive builders' facilities being used on defense work. This has made it necessary that the railroads in many cases handle the increased business now being offered with the power which they now have. I feel safe in saying that further improvements can, and will be made.

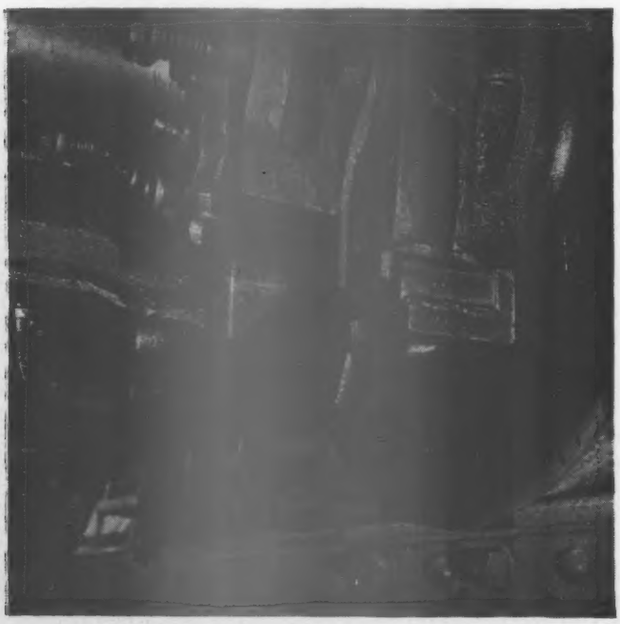
Reducing a Hazard of Derailment

(*Continued from page 523*)

case, however, the safety guide held the truck in line with the track and as a result, no damage was sustained by the engine or other equipment in the train.

At El Paso, a tender was being moved onto the turntable and due to improper alignment of the table, the tender was derailed. Under ordinary circumstances derailment of this tender in all probability would have caused a considerable delay. But the safety guides with which it was equipped, held the tender in line with the track so that only the front pair of wheels were derailed and the tender could be rerailed with a minimum loss of time.

We had a derailment in West Oakland yard of two of the Diesel power units from the City of San Francisco. As in cases involving trailing cars, it was found that the safety guides with which these power units were equipped, lapped over the rail as expected. Notwithstanding the fact that the speed at time of derailment was not more than 10 miles per hour, the lateral force exerted on the tie-bar flanges was sufficient to turn the rail over. The safety guides came through this ordeal with only minor abrasions; however, their action in keeping the power trucks in line with the track assisted materially in rerailing these heavy units.



An application of safety guides on an engine truck with inside journal bearings

Methods of Systematic Treatment of Feedwater

(*Continued from page 520*)

at the terminals and for some terminal blowdown as such checks may show to be required. In such cases certain general rules or procedure need to be followed.

Freshly injected water is cooler, hence heavier, than water at the temperature of steam in the boiler. It will, therefore, go to the bottom of the boiler due to its greater density. If the blow-off cocks are open while the water is being injected or immediately after it has been injected, a large amount of this freshly injected water is apt to be removed which does not materially improve the boiler conditions and represents wasteful practice.

Good terminal blowdown procedure is to maintain a brisk fire during this operation to insure good circulation in the boiler. The boiler is filled with water and after a short wait to make sure the fresh water is thoroughly mixed with the boiler water, the blow-off cocks are opened until a glass of water is blown out. If more than one glass of water must be removed, the procedure is repeated until the T.D.S. is reduced to the required figure. On each individual road the proper amount of blowing can be figured for each class of power based on incoming T.D.S. figures. Knowing the amount of water contained in the boilers of each class of power and the amount of water capacity from the bottom to the top of the water glass, it is a matter of simple mathematics to determine the reduction in T.D.S. for each glass of water removed. This information can be compiled and posted on a chart so that the people responsible for terminal blowing will know how much water should be blown out of the boiler for any given T.D.S. reading.

The report was signed by J. P. Powers (chairman), system boiler inspector, Chicago & North Western, Chicago; H. E. May (vice-chairman), shop engineer, Illinois Central, Chicago; S. P. Mahanes, district boiler inspector, Chesapeake & Ohio, Clifton Forge, Va.; I. N. Moseley, general boilermaker, Norfolk & Western, Roanoke, Va.; W. B. Graham, chief mechanical inspector, Gulf Coast Lines, Houston, Tex.; C. R. Kirkwood, boiler foreman, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind.; R. E. Coughlan, engineer of tests, Chicago & North Western, Chicago, and V. E. McCoy, chief engineer, National Aluminate Corporation, Chicago.

EDITORIALS

Diesel Crankshaft Shows Record Wear Resistance

A Diesel passenger locomotive which recently completed about one million miles of service was sent to the shop for thorough inspection and repairs, and an examination of the crankshaft showed wear on the bearings to be only .001 in. This unusual record of crankshaft performance is credited to the electrical induction method which was used for hardening the metal in the bearing surfaces. In this process the limited areas which it is desired to harden are heated by means of a magnetic flux set up by electric coils surrounding the surface, and the depth of heating is controlled by the magnitude of the electric current and the time it is allowed to flow. When the specified heating has been supplied, the bearing surfaces are quenched and given greatly increased wearing properties without altering the physical characteristics required in other parts of the forged crankshaft.

The crankshaft bearings are given the desired selective surface-hardening treatment by means of tunnel-line electric-induction equipment with the necessary electrical generator, control board and other details conveniently arranged so that the crankshaft can be easily worked on. Although the equipment used to harden locomotive crankshafts is somewhat different from that required for smaller parts, the same principle is utilized The process should be adaptable to other locomotive parts such as axles, crank pins, piston rods, etc. It is at present being widely employed in hardening smaller motor parts, gun bolts, tank sprockets and track pins, armor-piercing shot, aircraft assemblies and thousands of other war production parts.

The Proper Care Of Machine Tools

The present difficulty in securing replacement of worn machinery in railway shops and engine terminals re-emphasizes the necessity of giving the machines now in service the best possible care in order to minimize wear and extend their service life as much as possible. Good machinists and mechanics are known by the care given to tools which they use and, by the same token, machine shop foremen and supervisors are definitey responsible for the mechanical condition of all machinery and tools located within their respective departments.

Some railroads have been giving special attention to this subject for a number of years and, in an endeavor to stimulate the interest and pride of machine tool operators, have had their names shown on suitable name plates which are secured to the head stocks of the individual machine tools which they operate. Another method which suggests itself would be to offer a small prize, or honorable mention on the shop bulletin board, for the operator in each department who keeps his machine in the best condition, the award being made by a committee representing both the shop management and the machinist's organization, also possibly the general tool supervisor for the railroad.

Two unusually instructive and well-prepared bulletins, recently issued by an engine lathe manufacturer, contain a great deal of information on the highly important subject of keeping lathes clean and seeing that they are properly lubricated. There is no question that any reasonable amount of time expended in cleaning an engine lathe, like other types of machine tools, will be repaid many times over by increased accuracy, higher production, easier operation and longer service life. Scale, grit and fine chips, in conjunction with oil, form an abrasive which must be prevented from getting between all bearing surfaces if satisfactory results with the lathe or other machines are to be secured. Frequent and careful chip disposal are essential.

The general methods and equipment required for the proper cleaning of shop machinery are, of course, well known and yet need to be constantly brought to the attention of new machine operators and also to more experienced men who may become careless. Brushes of one kind or another are convenient for removing loose dirt and chips and are preferable to blowing with compressed air which has a tendency to force the abrasive dust into oil holes and between bearing surfaces. After brushing, it is a good practice to get rid of the last traces of grit and dust by means of a clean cloth, preferably slightly oiled to prevent the formation of rust on the highly-finished machine surfaces.

A small bottle brush is conveniently used for cleaning taper holes, but here again the final operation should be done by means of an oiled cloth. Spindle threads need to be thoroughly cleaned and oiled before application of a chuck or face-plate, also lead screw threads, both of which can be cleaned either by a brush or application of a cord as the screws are revolved. It is obvious that the threads in face-plates or chucks, and the taper shanks of lathe centers and drill chucks should receive the same careful attention if these parts are expected to run true and not stick when assembled in place. The need of proper cleaning of the compound

rest and tool-post assembly before setting up a new job is self-evident. The lathe should also be protected from abrasive dust in any tool-post grinding operations which may be attempted. In this connection, more or less elaborate dust exhaust systems, or small cups of oil located below the grinding wheels and arranged to catch dust particles, are quite effective and justify the small cost which may be involved.

It is very important that cleaning and oiling with the proper grade of lubricant be done at least once a day—more often in the case of multiple-shift operation. Too much stress cannot be laid on the necessity of using the grade of lubricant designated by the manufacturer on each bearing surface. Some bearings are so closely fitted that the machine oil must be diluted with kerosene for suitable lubrication, and the results of attempting to operate this part of the machine with an improper grade of oil can readily be imagined.

Shop men, like all others, are creatures of habit and, with the proper effort, machine-shop foremen and tool supervisors can induce machine operators to adopt the highly-desirable and profitable habit of inspecting, cleaning and oiling their machines at stated periodic intervals. In this way, accurate work, high production and maximum service life of the machinery are assured.

A Gloomy Outlook

The railway equipment authorizations announced by WPB on November 19 have been received with mixed feelings by railway managements. They might have been worse but they certainly are nothing on which to base an optimistic view of the transportation situation in 1943. The eight months' authorizations for 250 steam locomotives and 36 road Diesels and the six months' authorizations for 100 Diesel switchers, projected forward for the full year, would indicate a 1943 locomotive building program of 629 locomotives, about 425 of which will be available for freight service. The freight-car program, similarly projected, indicates additional cars amounting to just one-half of the 80,000 for which formal request was presented.

All records for motive-power utilization have been broken during 1942. For the month of August, the last for which the figures are available, 62.4 billion net ton-miles were handled in 58.3 million freight-train miles with 67.4 million road freight-locomotive miles. Net tons per train were 1,086 and gross tons per train 2,366. This movement was handled with an assignment of 24,358 locomotives, an average of 89 miles per day for all locomotives on line. In August, 1941, net tons per train amounted to 990 and gross tons per train to 2,223. The 24,425 locomotives then on line produced 49.2 billion net ton-miles in 50.3 million freight-train miles with 57.4 million road freight locomotive miles, an average of 76 miles per locomotive day for all locomotives on line.

An increase of 15 per cent in ton-miles has been estimated as probable during 1943. Such an increase will undoubtedly produce months in that year at least 15 per cent greater than the month of August, 1941. If no month in 1943 were greater than that, then in such a month there would be produced 71.8 billion net ton-miles. Assuming a further increase in train loading in 1943 equal to that of 1942 over 1941, the gross tons per train would be about 2,500 and, with the same ratio of net to gross train load as in 1942, the net tons per train would be 1,145. With such a train load 62.7 million freight-train miles and 72.7 million freight locomotive-miles would be required. Adding a net increase of about 325 locomotives within the year (425-100 locomotives scrapped), the 24,684 locomotives assigned to freight service would have to average 95 miles per day to produce these results—a six per cent increase in the intensity of locomotive utilization.

How far will 40,000 new freight cars go toward meeting the needs of 1943? No doubt there will be some relief in the open-top situation, but considered as a whole, about 10,000 of the new cars will be required as replacements and the 30,000 net increase will be a little more than one and one-half per cent. The records of freight-car performance established this year, then, will have to be exceeded by about 13 per cent. Net ton-miles per car day will have to increase from 994 as in August, 1941, to 1,123. This means either that car-miles per car day must increase from 49 to 55, or net tons per loaded car from the high record of 32.7 in August, 1941, to 37, or some combination of the two. In all probability most of the increase will have to be in miles per car day, since the effect of heavy l. c. l. loading is reflected in the increase of 2.8 tons per loaded car from last year. No such marked effect is likely to occur soon again.

Are such increases in utilization possible? There are those who a year ago would have said that the increases made during the past year were impossible. It is, however, dangerous at this time to assume that such increases can go on indefinitely. In the first place, maintenance will have to be continued to high standards without any recession from the present high percentage of all locomotives and cars in serviceable condition. But, the railroads are only beginning to feel the pinch of manpower. There is now talk in Washington of expanding the armed services up to 9 million men. This is about one-fifth of the male population between the ages of 17 and 64, and more than a tenth of all population between these ages. One estimate out of Washington is that it takes 18 men at home to keep one armed man in the field. This would call for a working population upwards of 20 million greater than our present total population of all ages. Such figures are evidence of the chaos in the thinking among government agencies involved in the prosecution of the war. From all of this muddle no one can say how far the railways may be compelled to get along without or to replace present manpower.

There is a growing recognition in many places—

some of them even in Washington—of the vital part the railways are playing—and must continue to play—in the successful progress of our war effort. Unfortunately, they are still officially regarded as merely one of the many civilian industries and activities, all of which are lumped together into one of the seven claimant agencies recognized by WPB in its new C. M. P. plan of controlling the flow of critical materials. Thus, ODT must compete with the whole field of civilian needs, through its "industry branch" of WPB for whatever it gets in the way of materials and equipment for the railway and not with the other six war agencies as it properly should.

If no greater understanding of the key nature of transportation is shown in dealing with the manpower problem than is being shown in dealing with the needs of the roads for motive power and rolling stock, the outlook for 1943, is, indeed, not optimistic.

Will the Back Shop Be the Bottleneck?

Estimates of an increase in traffic during the next year of approximately 15 per cent cannot help but be a cause for some serious thinking on the part of those who are charged with the responsibility for providing the motive power with which that traffic must be handled. Every railroad man in the official and supervisory ranks of both mechanical and operating departments probably is asking himself, at this moment, "Where are we going to get the locomotives?" As matters stand there are three places from which the motive power needed by American railroads can be secured—from the builders, in the form of new locomotives, from the back shops of the railroads of this country, in the form of restored locomotive mileage or from an increase in the utilization of power while it is on the road.

There is no need to waste many words here in discussing the question of new locomotives as a source of help, for the War Production Board having decided how many locomotives the railroads need consistent with production capacity and available materials has made public its authorizations of new power to be built. Whether or not this new power will meet the railroads' need is something which the future will demonstrate.

The utilization of locomotives in road service is now at the most intensive stage that it has ever been in railroad history and it augurs well for the future to know that there never was a time when operating men devoted as much study to the problem of improving utilization as they are doing right now. Coincident with the efforts being made by operating personnel to extend to the limit the daily mileages of motive power units there is also a real accomplishment being made in turning power at terminals.

Aside from these considerations there is a growing feeling on the part of mechanical men that the back shop may soon become the bottleneck of the motive power problem. In the effort to get the last mile of service out of a locomotive at the high operating speeds prevalent today, it is only reasonable to assume that, as time goes on, the locomotives that arrive at the shop for general repairs are requiring more man-hours of labor and more dollars' worth of material to restore them to service. If this is true, those having the responsibility for the operation of our back shops are confronted with the necessity of doing a heavier repair job on each locomotive while facing (1) a demand that the locomotive be returned to service in the shortest possible time; (2) an increasingly difficult situation with respect to materials and parts and (3) a shortage of man power.

In a situation such as this, those responsible for shop operation can approach the solution to a demand for greater output either by increasing the number of shop hours worked; by increasing the number of men on each shift; or by increasing the productivity of the available facilities of the shop. Unfortunately, the first and second of these three courses require something that is not readily available—additional man power. The first of the two courses can be solved, without recourse to the second, only by lengthening the working day.

When any consideration is given to the possibility of increasing the productive capacity of existing facilities, we come to one of the greatest handicaps with which railroad shops have contended for years—obsolete shop equipment. There are those in the railroad shop field who have justified the continuance in service of units of shop equipment far beyond the limits of their economic service life on the ground that these obsolete tools had productive capacity enough to meet the ordinary demands for shop output. A substantial increase in that productive capacity is now vitally necessary.

It is not necessary to go to great lengths to demonstrate the vastly superior productive possibilities of modern machine tools and shop equipment. The single example, in a certain shop, of six turret lathes which have not only displaced 13 obsolete turret lathes but have increased the output of that particular department to 150 to 200 per cent of its former production is a case in point. This example can be multiplied by as many times as there are similar installations in the railroad field. Added to this are the possibilities of new tools and tooling equipment which, in many cases, can increase the output of even the older machines.

If these things are true, why hasn't the railroad industry demanded its share of modern shop equipment in order to help play its part in the war effort? The answer to this question most frequently given to us is, "Why ask for something you can't get?" There is every reason to believe, at this moment, that any railroad company needing new machine tools or shop equipment may be able to get what they need if they will take the trouble to discover that some manufacturers of such equipment, who have been supplying defense plants, are now in a position to supply *some types of equipment* on reasonably short deliveries.

Is it not apparent that if you find out what can be had, and keep on asking for it, the chances are in favor of getting what you need?

THE READER'S PAGE

Two Ideas From a Boilermaker

To the Editor:

The Locomotive Boiler Inspection Law was put into effect in 1911. It gave the men responsible for the maintenance of the locomotive boilers prestige that they never received previously, and from that time on there was a noticeable improvement in boiler conditions, and a decided decrease in the number of boiler failures and accidents.

From that time until recently the boiler men had much to say relative to boiler appurtenances and their location, and also to the feed water used in the boiler and its treatment. This authority has been gradually taken away from boiler men on most railroads, and the result has been an increase of boiler accidents, and a great number of them have proved costly at this time in the loss of power in service, loss of life and loss of money.

After the locomotive inspection law was put in effect it was the practice of most railroads, when an explosion occurred, to call in the general boiler foremen or general boiler inspectors from other roads, to make a joint investigation, which quite often brought out facts, which may not have been published, but which were often used to prevent the reoccurrence of similar accidents. This practice seems to have been discontinued.

It is the writer's opinion that the large high-pressure boilers of today can be improved if proper consideration is given to circulation throughout the length of the boiler, instead of just around the fire box, as it has been known for years back by engineers and builders of stationary boilers that proper circulation which makes for equal temperature eliminates priming of the water in the boiler and prevents cracking and rupture of the boiler plate.

This writer has no patents or appliances to sell, but believes that better circulation can be obtained by the application of pipes from the bottom of the shell, back of the front flue sheet to the throat sheet. Where syphons are used these pipes could enter the throat sheet at the syphon washout plug openings.

A Master Boilermaker.

Instruments for Measuring Hardness

To the Editor:

Recently at one of the large railroad shops I ran across an instrument known as a scleroscope which was used for determining the hardness of steel. It was nothing more than a small cylinder having a plunger at one end and a hole at the other. A gauge was attached to the upper end of the cylinder. To operate, it was merely placed on the steel to be tested, the plunger forced down, and then released. After a delay of a few seconds, the needle of the gauge moved and registered the hardness. The whole operation was simple, rapid, and apparently exact.

I have made inquiries as to exactly how this instrument works. In your columns I wonder if you could explain the principle on which this device works?

R. T. Roberts.

[There are several different types of instruments for measuring the hardness of metals. The Brinell hardness number is determined by pressing a small hardened steel ball of standard diameter into the metal to be tested. The area of the depression and the pressure exerted are the factors from which the hardness number is determined. The Shore scleroscope consists of a small weight which falls through a glass tube to strike the metal to be tested. The striking end of the weight is very small so that the weight itself is large in relation to the area in contact with the material to be tested. The hammer is allowed to fall through a standard distance measured on a scale and the hardness number determined by the height to which the hammer rebounds.—Editor.]

Draft-Gear Bearing Area

To the Editor:

A member of the Committee on Couplers and Draft Gears calls attention to an article entitled "More Draft Gear Bearing Area Needed," appearing on page 397 of the September issue of the *Railway Mechanical Engineer*. In this article reference is made to the 1937 report of the Committee on Couplers and Draft Gears, A. A. R. Circular DV-917, in which it was recommended that bearing area of cast-steel vertical yoke be increased 67.5 per cent and to reduce the wedging effect on the bearing area by decreasing the taper of the contact surface.

Contrary to the author's statement that "I do not believe that this was accepted," this change in design was included in Letter Ballot Circular DV-924 dated August 20, 1937, page 77, Proposition 19, and was approved, as will be noted from result of Letter Ballot in Circular DV-927 dated October 27, 1937. These changes were incorporated in the Manual in 1939 and are now covered by pages C-38-A-1941 and C-38-B-1941.

In the second paragraph of the article mention is made of inspection by the author of a new yoke, removed from a car, bearing casting date 12-41, and reference is made to damage to the gear housing, also illustrated, as a result of using yokes of this design, which damage it is stated would not have occurred if the committee's proposed change in design of yoke had been made at that time.

V. R. Hawthorne,
Executive Vice-Chairman, Mechanical Division, A. A. R.

Erie Modernizes

Hornell Flue Repair Shop

Well-engineered plant speeds flue repairs—Electric eye control and other automatic devices used—One shop now does the work of two—New method of cleaning flues employed

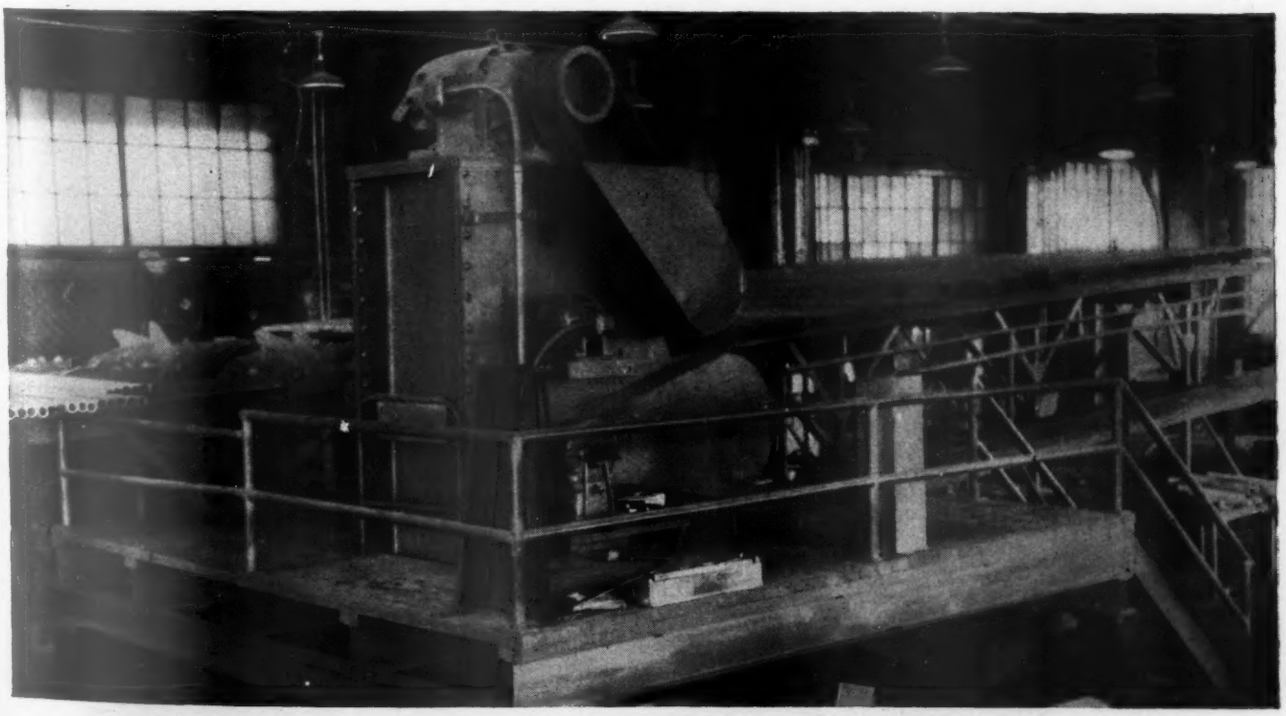
RECLAMATION of locomotive boiler flues on the Erie is now done for the entire railroad at the Hornell shops in a well-equipped, well-laid-out shop which has recently been placed in full operation. Normally the Erie removes, repairs and reapplies approximately 75,000 flues annually. They range, in outside diameter, from 2 in. to 5½ in. and, in length, from 11 ft. 6 in. to 24 ft. 0 in. Formerly it was necessary to have flue shops in operation at both Hornell, N. Y., and Meadville, Pa., to perform necessary flue repairs.

After studying flue-repair methods in a number of plants, Erie engineers devised the present set-up which incorporates new machinery and original methods which are not in use on any other railroad. Operation of the system is such that the manual handling of flues is eliminated and many of the operations are completely automatic. All machinery is housed in a building having a clear floor area 66 ft. in width and 148 ft. in length. This building is of brick and steel construction. It is located immediately adjacent to the locomotive erecting shop.

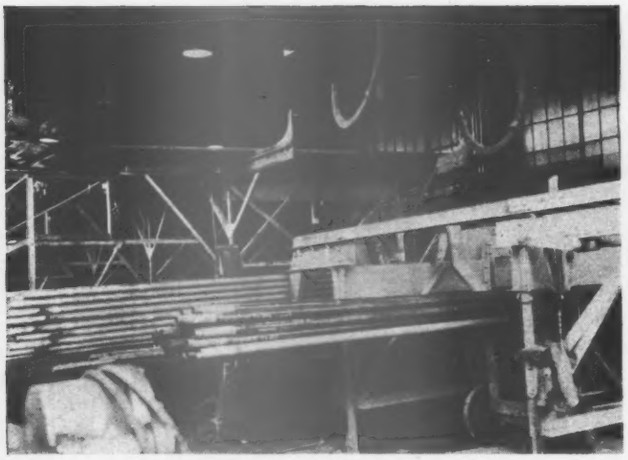
Sequence of Operations in the Flue Reclamation Plant of the Erie at Hornell, N. Y.

1—Cut off ragged end, the end removed from the firebox flue sheet.
2—Clean scale from outside of flue.
3—Inspect flue for pitting and other defects.
4—Weld on safe end.
5—Heat the safe end in an oil furnace to forging heat.
6—Swedge the flue end to the proper size to fit the firebox flue-sheet hole.
7—Cut the flue off to proper length measuring from the swedged end.
8—Anneal the cut end by heating to 1,600 deg. F. in an oil furnace. Cool in still air.
9—Form the annealed end. When the flue is first removed from the annealing furnace the hot end is placed in a pneumatic clamp die machine which forces a plunger inside the flue. This operation sizes and trues up this end of the flue to fit the front flue-sheet hole.

Flues removed from engines undergoing repairs are brought into the shop on buggies and lifted to the top of the "dirty flue" gravity conveyer rack by large hooks which are suspended from an overhead crane. This rack, constructed of three channel-and-angle runways spaced 5 ft. apart, is 84 ft. in length, has a slope of 0.7 in. per ft. of length. The first cutoff saw for removing ragged ends is located at one side of the center of the rack. The upper half of the rack is equipped with steam coils which serve to dry out any moisture in the scale on the outside of the flues. This drying process is necessary to prevent plugging up the cleaner to which the flues later pass. At the end of the drying section



The receiving rack and the first cut-off saw

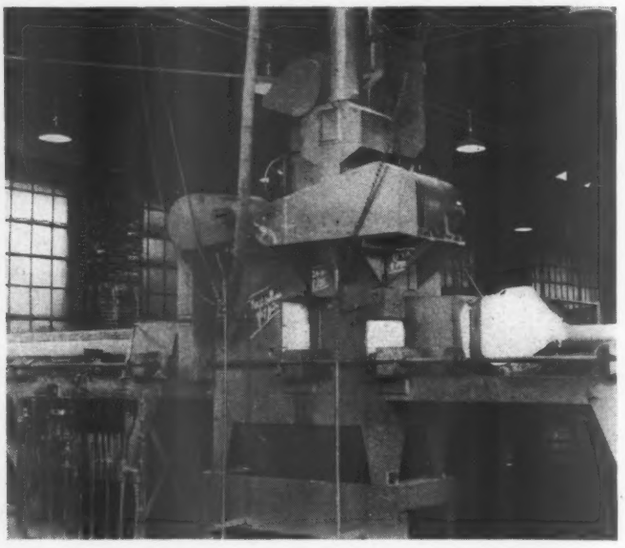


The large lifting hooks raise flues from shop buggies onto the first rack where they are dried before going through the cleaner. These hooks are also used to place finished flues, shown in the foreground, onto shop buggies for delivery to the erecting shop

Electric eye and other automatic controls are used throughout the newly designed shop

of the rack, above the cutoff saw, there is a feeding mechanism, operator controlled, which moves the flues into the saw.

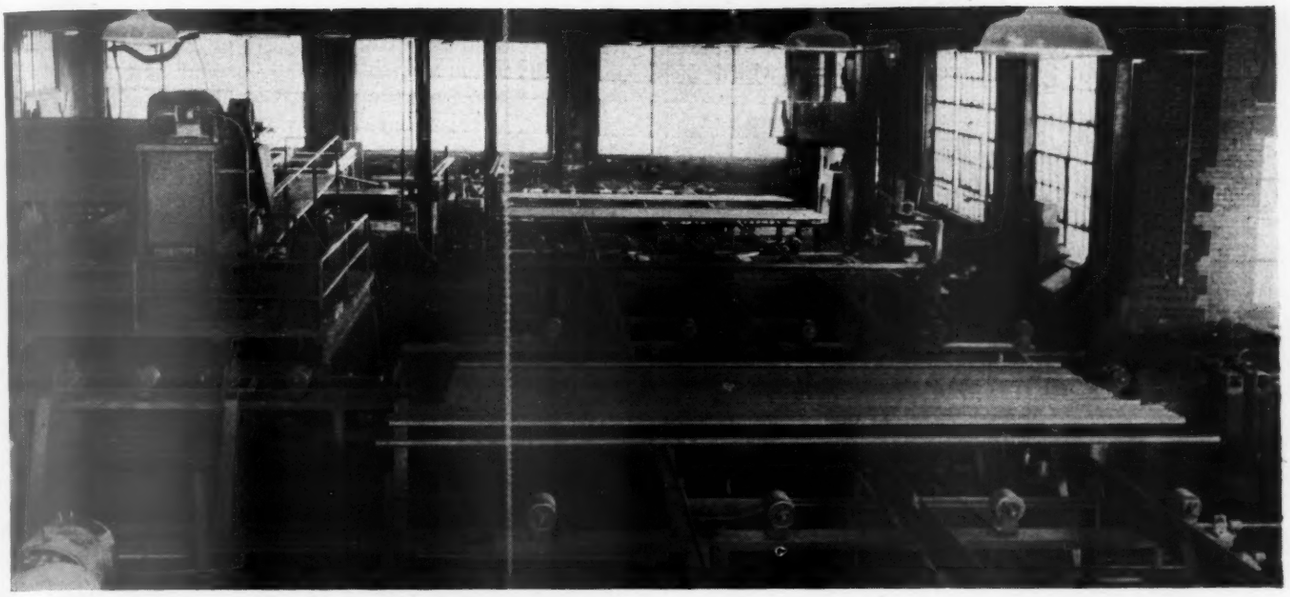
After leaving the cutoff saw the flues roll down to another feeding mechanism which starts them through the flue cleaner. This feeder is controlled by an electric eye. As the end of a flue passes out of the beam of the eye in entering the cleaner the light beam is re-established and operates an electric contactor and air cylinder which revolves a cam feed one tenth of a revolution thereby feeding another flue onto constantly rotating conveyor rolls leading to the cleaner. These conveyer rolls are V-shaped and serve to move flues through the cleaner at speeds ranging from 8 ft. to 29 ft. per minute. The speed is manually controlled and is set according to the scale condition of the flues being cleaned. Angular setting of the conveyer rolls serves to rotate the flues passing through the cleaner and uniform scale removal is obtained.



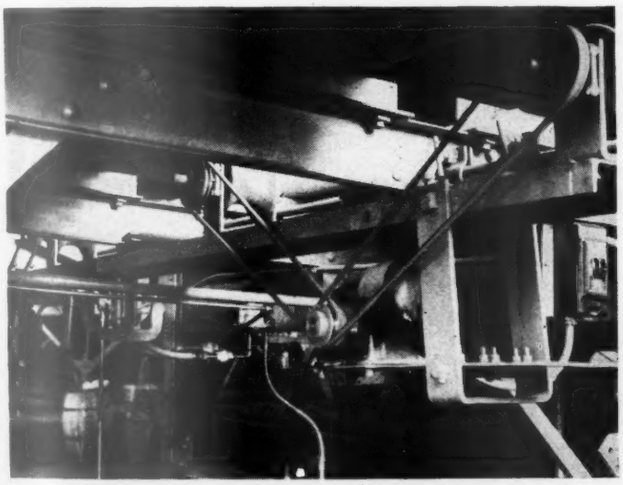
Flues pass through the cleaner at a rate of speed determined by the amount and condition of the scale to be removed

A Ryerson-American Wheelabrator Flue Cleaner developed by the American Foundry Equipment Company, Mishawaka, Ind., is used. It consists of a sheet-iron hous-

Dirty flue rack below the cut-off saw—The cleaner is also shown



After cleaning, the flues are raised automatically onto this rack which carries them through the remaining operations



Many varied drive arrangements under the clean flue rack determine the speed with which flues are delivered to the welder

ing with a centrifugal wheel mounted directly over the path of the flue. The wheel is constructed of two discs which are so arranged that metal shot or grit fed into the center of the wheel will be thrown downward onto the flue by the action of centrifugal force. Scale is removed from the flues down to the bare metal and it is reduced to a fine dust which is drawn off by a suction fan through vertical pipe connections at the top of the cleaner. This dust is passed through a filter and drops into a chamber from which it is removed periodically.

As clean flues leave the cleaner they proceed along another series of conveyer rolls to a point where they interrupt the beam of another electric eye. When the beam is broken, machinery is set in operation which lifts the flue onto the "clean flue" rack which leads to an automatic welding machine. At this point it is possible to scrap flues which visual inspection have shown to be unfit for reclaiming. As flues emerge from the cleaner an operator determines whether excessive pitting is evident. If there is such pitting he switches off the electric eye which controls the lifter and the flues continue along another conveyer through an opening in the wall of the building to the scrap flue pile outdoors.

The "clean flue" rack, which slopes 0.35 in. per ft., is 113 ft. in length and slopes in a direction opposite to that of the "dirty flue" rack. As the flues move along the "clean flue" rack they reach a 6-in. electric butt-welding machine where safe ends are applied. After the welded joint has been rolled, the flue enters upon a set of three horizontal spiral screws which carry it through an end-heating furnace. The speed of operation of these screws can be controlled between 0.8 and 5.0 revolutions per minute and the speed of the spiral is set according to the size of the flues being worked. Four flue ends are in the furnace at a time and they are raised to the proper-temperature for the swedging operation. After swedging, the flues roll by gravity to another cut-off saw where they are cut to the proper length for re-application to locomotives.

Leaving the cutoff saw, the flues move over another set of spiral screws which carry them through an annealing furnace at the rate of speed required for flues of various sizes. Another series of conveyer rolls then carries the completed flues to a delivery rack. Here again an electric eye is employed to make this operation

Welding a safe end on a 3½ in. flue—After welding, the flue moves on the rollers to the rolling machine in the background

automatic. As the beam is broken by flues moving along the conveyer rolls they are passed onto a chain elevator which raises them to a delivery rack from which they

Flues move through the heating furnace at speeds determined to deliver them at the proper temperature for swedging

are loaded on the shop buggies employed to carry sets of flues to locomotives on the erecting floor.

Nineteen electric motors of ½-hp. each are required to operate the various conveyer rolls. The "dirty flue" cutoff saw was designed and built by the Erie and has

Spiral screw feeder at the swedging furnace

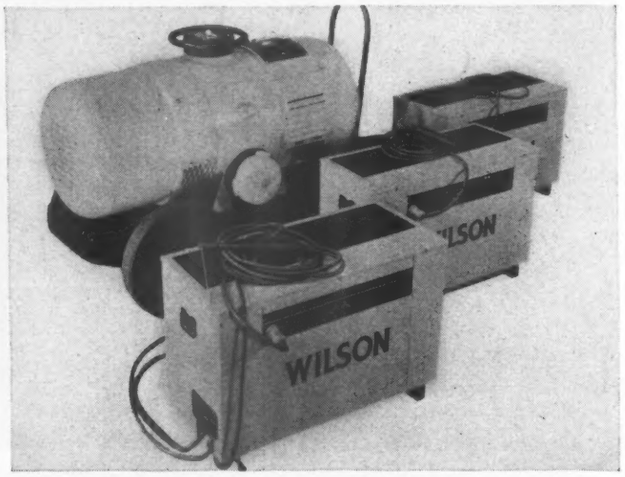
a capacity for making 400 cuts per hour on any size flues. The saw blade, 42 in. in diameter, is driven by a 40-hp. motor.

The design and installation of these new facilities was carried out by C. F. McKinney, supervisor of tools and machinery, and members of his staff.

Control Stations on Arc-Welding Generators

Auxiliary electric stations to be connected in series with the welding circuit of any constant-potential arc-welding generator are said to increase the practical effectiveness of the machine by permitting two or more operators to work independently from the same generator. Made in 75-amp, and 150-amp, capacities, these units when attached to the machine can be operated simultaneously and each operator can weld as he sees fit, regulating his current without affecting the other operator or operators. Current can be regulated without breaking the arc through the use of a switch control. This allows an operator to start on cold work with a "hot" arc and gradually reduce the current as the work warms during welding. Or the control can be set to deliver a constant current at the arc.

Using two 75-amp. control stations, a 200-amp. gen-



Separate switch-controlled stations increase the practical effectiveness of constant potential arc-welding generators

erator can serve two operators. A higher efficiency and a better load factor result because the generator is operated at near its rated capacity at all times. A 400-amp. generator can serve five or six 75-amp. stations, or three of four 150-amp. stations. Each operator can draw precisely the amount of current which he needs up to the capacity of his station. Known as the "Honey Bee" these arc-control stations are manufactured by the Wilson Welder and Metals Co., New York.

Welding Saves Time In Punch Press Repair

The reclamation of car and locomotive parts by welding has had a wide range of application in railroad shops. Also important is the value of welding in keeping shop

The teeth on this power-drive clutch for a duplicator punch press were restored by welding, machining and flame hardening

machinery operating. The illustration shows a clutch power drive for a duplicating punch press used in the fabrication of car parts at a major car-repair shop on which badly worn teeth were built up, machined and flame hardened in a much shorter time than would

have been required to make or otherwise obtain new parts.

In this case the teeth were built up by the oxyacetylene process using plain carbon-steel welding rods. Application was made without preheating of the entire piece. After sufficient weld metal has been applied the clutch parts were taken to the machine shop and tooth contour was restored on a milling machine. When the machining operation was completed the teeth were flame hardened and the parts were ready to be restored to service.

Long and expensive delays caused by breakdowns in machinery parts may often be avoided by such reclamation by welding as was employed in this instance on a machine part which is subjected to severe service stresses.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Repairing Holes In Passenger Truck Side Frames

Q.—We have made it a practice to build up the brake rod hanger pin holes and the spring equalizer bolt holes when these parts wear through the bushings. This is a tedious job and not too satisfactory. Can you suggest a better method of repairing these holes?

A.—Perhaps the best and quickest method of repairing the worn holes on passenger car trucks is to round out the hole with the cutting torch. The new bushings are made to fit the flame cut hole as near as possible. After the bushing is driven into place with a hand hammer it is welded securely with the electric arc using a heavily coated rod.

Welding Cracked Spring Saddles

Q.—Is it permissible to weld cracked spring saddles?

A. Cracked spring saddles may be welded. Cracks usually occur near the top on the side of the saddle. The most common method used is to cut out these cracks with the cutting torch and fill the resulting vee, using heavy coated electrodes. All spring saddles that have been welded should be annealed.

Building Up "Snow" Pulleys

Q.—During the winter months we use a sectional pulley for driving passenger-car generators. This pulley is made of ¼-in. plates spaced about 1½ in. apart so as to break up the snow and ice that accumulates on the belt. These plates wear rapidly. We have tried building up the edges by both arc and oxyacetylene methods but it is a long and tiresome job. Do you know of an easier way to rebuild these pulleys?

A—A welder on a northern railroad solved this problem by using additional pieces of plate. The pulley is turned down until the plates upon which the belt runs are of equal diameter. The amount of plate needed to build the pulley back to its original size is measured and strips of steel the proper width and length are cut. Usually, this takes pieces ¼ in. by ¾ in., (the length varies with the width of the pulley). The pulley is set up on the bench and the strips tacked in place until each section has a new piece tacked to it. The new pieces are then welded all around using down-hand coated rod. The pulley is then sent to the lathe and the crown machined on the added material.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Welding on Boiler Shells

Q.—When applying pipe clamps or other construction to the shell of a boiler by welding, in place of studs, would the efficiency of the shell be affected? If so, what provision should be made in determining the working pressure of the boiler, making the proper allowance for these welds?—F. M. J.

A.—Welding on the shell course of a locomotive boiler is not considered good practice and is generally prohibited for the reason that the internal stress set up in the plate due to the welding cannot be readily stress relieved.

The A.S.M.E. Code for Power Boilers, Par. P-186 (d), makes provision for determining the strength of the shell, when non-pressure parts are tack welded to it as follows: "Non-pressure parts may be tack welded to the shell or drum of a boiler, provided the strength of the shell or drum is computed with such welds considered as the equivalent of holes drilled through the shell of the following diameters:

(1) "For material containing more than 0.35 per cent carbon, such as that used in forged seamless steel drums, the diameter of the equivalent holes shall be taken as twice the maximum dimension of the weld, but in no case shall a weld exceed 1 in. in length.

(2) "For the material containing not to exceed 0.35 per cent carbon the diameter of the equivalent holes shall be taken as the maximum dimension of the weld plus ½ in., but in no case shall a weld exceed 3 in. in length.

(3) "The efficiency of the ligaments between any two of the welds (considered on the basis of equivalent holes) shall not be less than the required efficiency for ligaments or longitudinal joint of the drum.

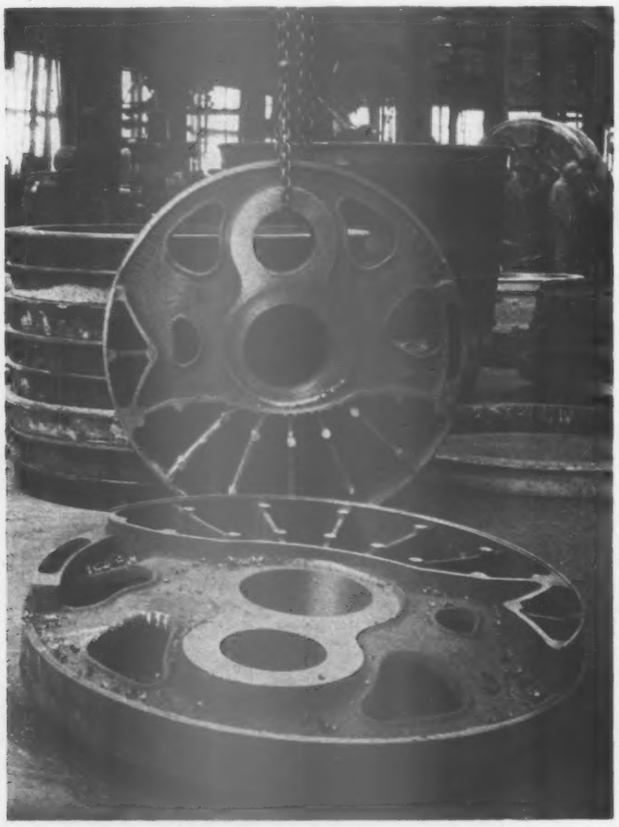
"When non-pressure parts are attached by fusion welding to pressure parts of carbon steel containing not more than 0.35 per cent carbon, or of molybdenum steel containing not more than 0.20 per cent carbon, no deductions need be made on account of welds having a throat thickness not exceeding ¼ in., if the welds are not over 3 in. in length and have a center-to-center distance not less than twice this length. This rule also applies to continuous welds longer than 3 in., if the weld metal is deposited intermittently in sections not over 3 in. long, with center-to-center distances not less than twice this

length, and if these welds are peened and the intervening space then welded and peened.

"When non-pressure parts are attached by fusion welding and the drums are subsequently heat treated or stress relieved in accordance with Par. P-108, no deductions need be made on account of the welds."

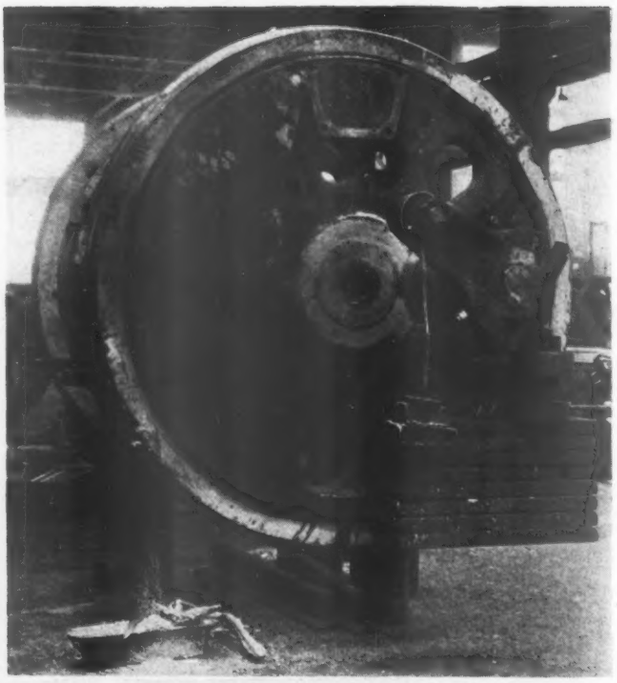
Counterbalancing Driving Wheels

With present high operating speeds, the methods used in counterbalancing driving wheels assume increasing importance. The illustrations which accompany this article show how this operation is performed at the Albuquerque, N. M., shops of the Atchison, Topeka & Santa Fe. In order to secure maximum accuracy, the wheels are balanced so as to take into account not only the weight of the driving rods and unbalanced reciprocating weights, but the eccentric cranks are mounted in place and weights suspended from the pins, equivalent to the back end of each eccentric rod.



A pair of main driving-wheel centers

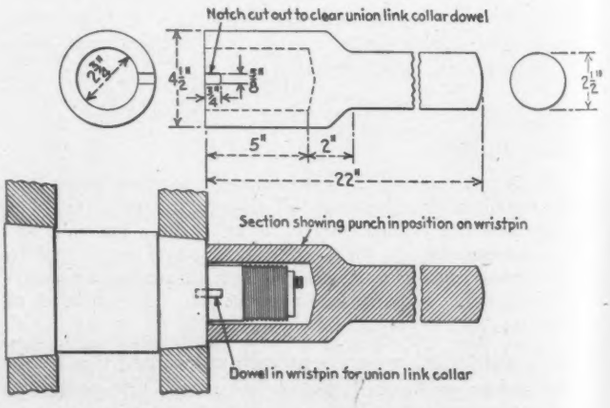
In cross-counterbalancing the main driving wheels, to compensate for the fact that the revolving weights are not all in the same plane, a pocket is cast in the wheel center at right angles, or 90 deg. from the main pin position, this pocket being filled with the required amount of lead in accordance with the degree of cross-counterbalance desired. The use of this pocket has the effect of shifting the center of gravity of the combined counterbalance weight the few degrees necessary, without the complication involved in actually moving the angular position of the main counterbalance.



The weight of the back end of the eccentric rod is taken into account in counterbalancing main driving wheels at the Albuquerque shops of the Santa Fe

Punch for Removing Crosshead Wrist Pins

The accompanying drawing shows a punch which has been developed in the locomotive shop of a Canadian railroad, the use of which makes it possible to knock out locomotive crosshead wrist pins without the necessity of striking the pin on the threaded end with the possible danger of damaged threads or grease fittings. An additional advantage of this particular type of punch is that it applies the force of the blow at the end of the tapered section.



This punch applies the blow at the tapered section of a crosshead wrist pin

Hopper Cars Repaired with New and Old Materials

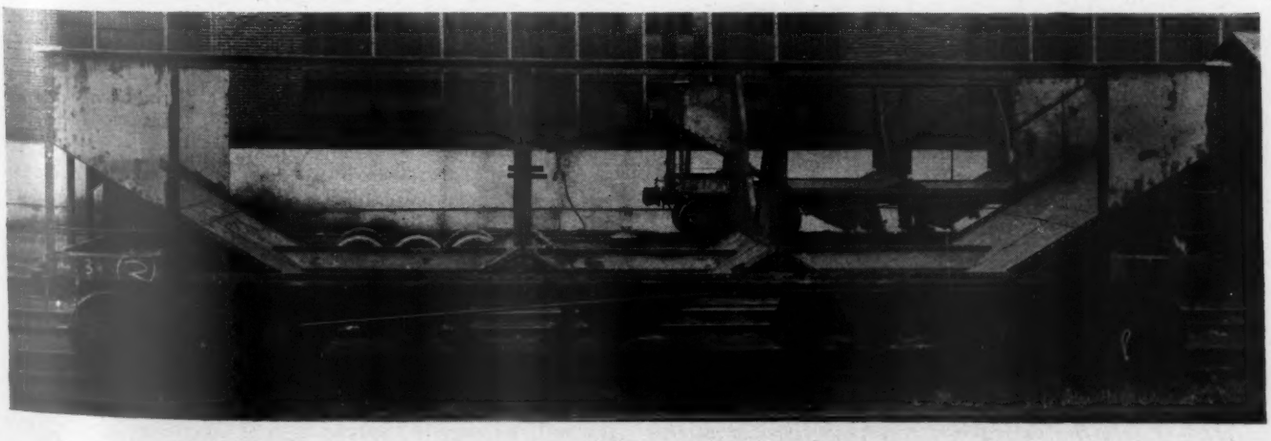
Keeping hopper cars repaired and in service when side systems required renewal and no steel was available of sufficient width to meet the original structural design was a problem which faced the mechanical department officers of one railroad in its effort to continue a 70-ton hopper car repair program. A survey of the railroad's steel supply disclosed that a quantity of sheet steel was on hand which was intended for the re-flooring of a series of mill-type, steel-floor gondola cars. Work on this series of cars had not been begun and it was decided to utilize this steel in order to continue the side replacement program on hopper cars. The flooring steel was not of sufficient width to extend from the side sill to the top angle of the hopper cars and this made it necessary to redesign the side structure to make possible the use of the steel.

Steel from the top sections of the sides removed, in the area of least corrosion, were sheared to provide a sheet of a width great enough to join to the gondola floor sheets and, by the use of a longitudinal butt strap, give a sheet of the desired width. The new steel was used along the side sill, the area of greatest corrosion, while the older steel was returned to its place at the top of the side section. Each car side required two sections which were assembled on jigs on the shop floor and then applied to the car.

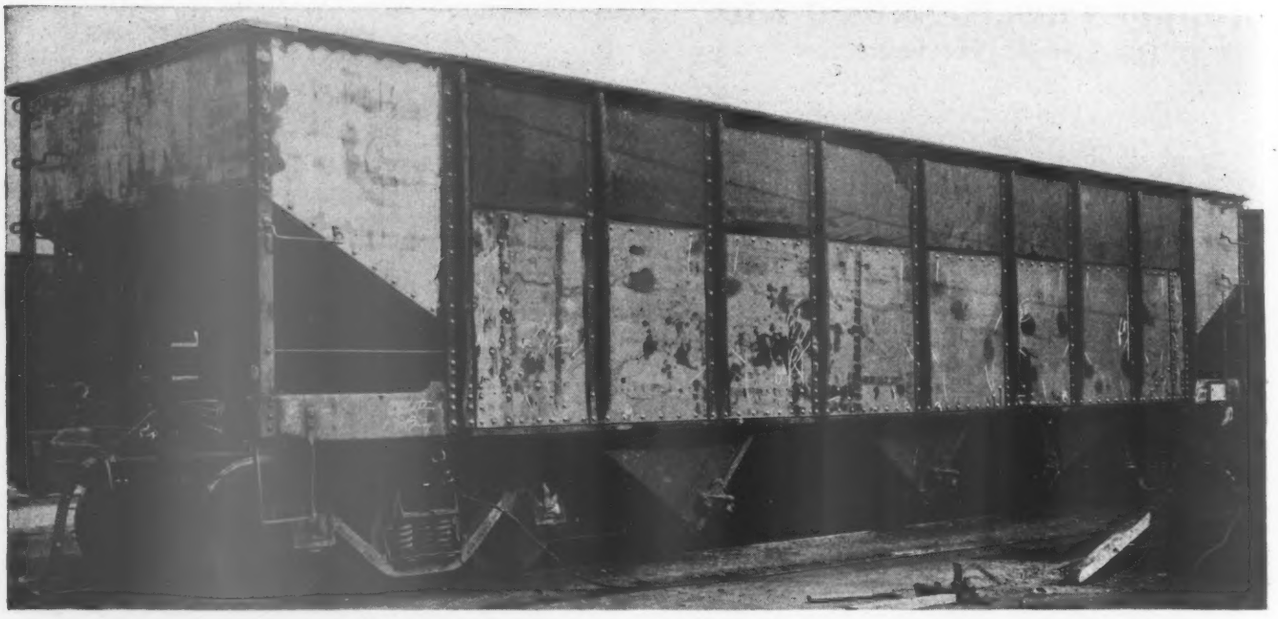
A progressive system of repair was used for the completion of twenty cars each working day. Cars were stripped inside the shop where side, corner and end sheets, side and end bulb angles, and K-2 type air brakes were removed. Passing from the stripping location the cars progressed through construction operations until the bulb angles, corner caps, end sheets, side corner sheets and AB brake equipment brackets had been applied. When this work was completed the cars were drawn by a tractor and cable arrangement onto a transfer table and moved to an adjoining track for the balance of the shop operation. One of the photographs shows a car at this stage of the work.

The first operation on the second track was the application of the cylinders, valves and reservoirs for the AB brakes. In this same location the trucks were completely overhauled. Moved forward by cable and winch, the cars, worked in pairs, advanced to the spot in which the composite sides were applied. Brake piping and connections were also applied in this working location. After the next movement of the cars side stakes and

Applying a side section built of new and old materials to a hopper car—The jigs for the preparation of the sides are also shown



Hopper car ready for the application of new side sections



Completed car before painting—The neat appearance and structural strength of the composite side is evident

inside stake plates were placed in position and fitted up for reaming. The next two working spots were for reaming and riveting operations. In the final inside shop position, work on the brake system was completed while the draft gears were checked and repaired when necessary. After a final inspection the cars left the shop and went onto the paint track where they were cleaned, two coats of paint applied and the stencilling completed except for car weights. After weighing the stencilled weights were put on the cars and they were released to service.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

129—*Q.—What prevents back flow from the auxiliary reservoir?* A.—Check valve *73* permits charging (brake pipe to auxiliary reservoir) but is seated by a spring *89* to prevent back flow from the auxiliary reservoir when that pressure in passage *5g* is higher than brake pipe pressure in passage *5f*.

130—*Q.—What is the position of the release piston during the charging operation and what serves to place it in such a position?* A.—Release position. The service slide valve chamber *C* and the release side valve chamber *D* are connected by passage *5g* so that auxiliary reservoir pressure is the same in both chambers at all times. Auxiliary reservoir pressure in chamber *C* is also connected to the spring side of release piston (chamber *K*) through port *a* in service slide valve and passage *a-1*. With air pressure acting on release piston balanced, spring *116* moves the piston and attached slide valve *112* to release position.

131—*Q.—What communications are opened by reason of this position of the release piston and slide valve?* A.—Cavity *Q* in the slide valve connects displacement reservoir passage *3b* to exhaust passage *10*.

132—*Q.—Is the emergency reservoir charged at this time?* A.—Yes, simultaneously with the auxiliary reservoir, from the release slide valve chamber, through passage *2c* (at the right end of the release slide valve), passage *2f*, past ball check valve *195* and flat check valve *73c*, passages *2k* and *2a* and pipe *2* to the emergency reservoir.

133—*Q.—How long does communication exist between the auxiliary and emergency reservoirs?* A.—As long as the auxiliary reservoir pressure is higher than the emergency reservoir pressure, spring *89c* is overcome and check valves *195* and *73c* are unseated, permitting this charging flow, but when the emergency reservoir pressure is higher, the check valves are seated. This action prevents back flow from the emergency to the auxiliary reservoir.

134—*Q.—Describe the initial flow of brake pipe air in the emergency portion.* A.—Brake pipe air in chamber *B* on the face of emergency piston flows through charging choke *27* to chamber *E* on the slide valve side of the piston and through passage *4* to the quick action chamber.

135—*Q.—Are the supply reservoirs charged at this time?* A.—Yes, simultaneously with emergency and auxiliary reservoirs to existing brake pipe pressure.

136—*Q.—From what sources are the supply reservoirs charged?* A.—From auxiliary reservoir through the release slide valve chamber *D*, port *r* in the release slide valve, passage *r1* in the seat, past ball check valve *74* and flat check valve *87* to passage *6* and the supply reservoirs. Spring *84* is overcome and check valves *74* and *87* are unseated, permitting this charging flow as long as auxiliary reservoir pressure is higher than supply reservoir pressure, but when supply reservoir pressure is higher, it seats the check valves and prevents back flow from the supply to the auxiliary reservoir. From brake pipe air in chamber *A* on the face of the service piston, through passages *1c* and *1d* cavity in the limiting valve slide valve *136*, passages *1k* and *1f*, past ball check valve *74a* and flat check valve *73a* to the chamber above flat check valve *87*, where the flow combines with the charging flow from the auxiliary reservoir through passage *r1*, thence to the supply reservoirs through passage *6*, spring *89a* is overcome and check valves *74a* and *73a* are unseated, permitting this charg-

ing flow as long as brake pipe pressure exceeds supply reservoir pressure, but when supply reservoir pressure is higher, it seats the check valves and prevents back flow from the supply reservoirs to the brake pipe.

137—*Q.—Is the supply for brake applications always available under the electro-pneumatic operation?* A.—Yes. The brake valve on the power unit maintains charging connections for all HSC brake application handle positions so that the reservoirs are continually charged in this manner.

138—*Q.—At this stage what is the status of the application and release magnets of the 21-B magnets on each locomotive and car unit?* A.—With the application and release circuits open at the master controller on the locomotive unit, the application and release magnets are de-energized. (Refer to Fig. 18.)

139—*Q.—What is the position of the application and release magnet valves at this time?* A.—Auxiliary air unseats by-pass valve *5* and flows to passage *6a*, charging the chamber beneath application magnet valve *34*, which is held seated by air pressure and its spring *35a*. Release magnet valve *62* is unseated by spring *35*, thus connecting passages *4a* and *x*, opening the straight air pipe to the exhaust.

High-Speed Freight-Car Trucks

*By James A. Shafer**

The earliest designs of cast-steel freight-car trucks had separate journal boxes attached in various ways. The next step was to cast the journal boxes integral, and for the last ten years there have been several designs manufactured that eliminate the spring plank.

Other than refinements in design, such as the change from T-section to U-section side frames and other improvements that increase the factor of safety, there has not been much change from the first integral-journal-box side frames. The trend in recent years has been away from the pressed-steel bolster and to the cast-steel bolster.

The spring suspension adopted by the A. A. R. in 1915 was used in freight-car trucks until about 1933 when a new spring was designed primarily to reduce spring failures. This 1933 spring had greater capacity and less deflection than the 1915 spring but did not ride as well.

About the time that the spring-plankless trucks were introduced an effort was made to improve the riding qualities of freight cars and the snubber or stabilizer appeared on the market. To test these various devices the A. A. R. ran a series of tests in 1933 at speeds up to about 60 m.p.h. These tests showed that trucks equipped with plain coil springs would bounce or oscillate vertically when the natural period of the springs was in resonance with the shocks caused by the rail joints.

Performance of 1915 A.A.R. Spring

It was found that the 1915 springs rode smoothly up to about 40 m.p.h. with a light load and to about 36 m.p.h. with a heavy load. The 1933 springs had corresponding speeds of about 43 m.p.h. and 38 m.p.h. As the speed was increased the vertical oscillations became violent and at the worst point the critical speeds were discovered to be about as shown in the table.

Approximate Critical Speeds of Freight-Car Springs in Miles an Hour

	1915 spring	1933 spring
Light load	47	52
Heavy load	41	47

An increase in the load reduced the speed at which oscillations occurred and also reduced the intensity of the shocks. The tests indicated that an increase in speed above the critical points tended to reduce the shocks, but near 60 m.p.h. which was the top speed reached on these tests, the shocks began to increase in intensity again.

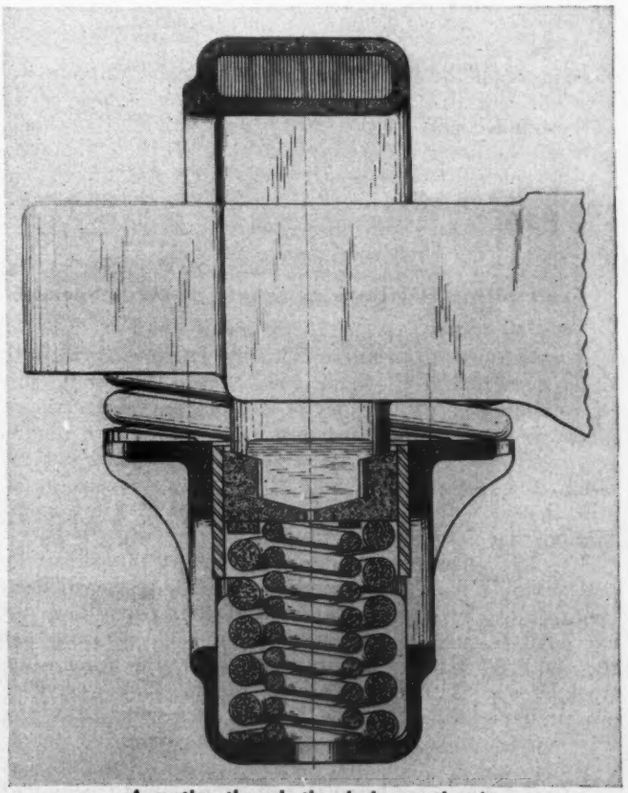
A comparison was also made between concentric and eccentric wheels. It was found that the eccentric wheels caused severe spring oscillation at speeds between 25 and 30 m.p.h. whereas true wheels did not. On the other hand, the eccentric wheels produced less disturbance at the higher speeds where the oscillations were caused by the rail joints.

All of the stabilizing devices tested improved the ride and some of them removed over 90 percent of the bad riding qualities of the plain spring group. Since the above tests were run the 1936 A. A. R. spring has been adopted. It has less capacity and more deflection than the 1933 spring.

1939 A.A.R. Spring Tests

Because freight train speeds have been constantly increasing and because the 1933 tests reached a maximum speed of about 60 m.p.h., the A.A.R. ran a test in 1939 to investigate the riding qualities and safety of freight-car trucks at speeds up to 85 m.p.h.

These tests also showed that plain coil springs ride badly when their natural period of oscillation is in

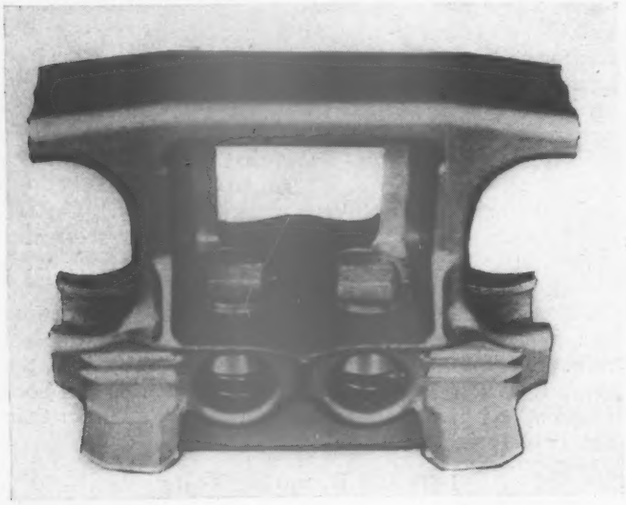


A section through the dual control units

* Specialty Development Engineer, National Malleable and Steel Castings Co., Cleveland, Ohio. This paper was read before the Eastern Car Foremen's Association in New York on Nov. 13, 1942.

resonance with the shocks produced by the rail joints or out-of-round wheels. Since the natural period of oscillation of coil springs is determined by the deflection, it follows that the critical speed for any car is determined by the load the car is carrying.

The critical speed for average freight cars so far as wheel action is concerned, was found to be about 25 m.p.h. and rather narrow in range, sometimes only about 2 m.p.h. wide. The resonance from rail joints occurred at speeds from 40 to 50 m.p.h., but the range was found



Looking from the inside of a side frame at the dual control units in position

to be as much as 10 m.p.h. wide. Because of this the effect of rail joints was felt at speeds from 35 to 55 m.p.h.

The latter cause for bad riding is much more serious from an operating standpoint because of the speed at which it occurs and the relatively wide range.

It had been thought that there might be other critical speeds when the unexplored range above 60 m.p.h. was reached, but the observers could not detect any period of resonance above 60 m.p.h. They found the shocks at these higher speeds were due to individual low spots in the track. In the speed range above 60 m.p.h. the shocks seemed to increase in intensity with an increase in speed but the indications were that the maximum shocks had been recorded before reaching 85 m.p.h.

Controlling Oscillation, Safety at High Speeds

This oscillation of plain coil springs can be reduced and controlled to some extent by friction springs or other devices and all of the trucks tested had some sort of an energy absorption device except the A.A.R. trucks. There is some minimum energy absorption rate that is required to take care of these spring oscillations but too much absorption may make the spring suspension so stiff that it will do more harm than good. It was indicated that 20 per cent was about correct.

The 1939 test report states that practically all of the trucks would have been satisfactory if the tests had been confined to the mainline only or if the speeds had not exceeded 60 m.p.h. Therefore, the problem is to get the required riding qualities and safety on branch-line track at speeds in excess of 60 m.p.h. However, it is our understanding that the branch over which this test was run is probably the equal of much main-line track.

When speeds above 60 m.p.h. were reached it was discovered that in addition to bad riding some trucks had a tendency to oscillate horizontally or "see-saw." This might be described as an unsquaring action where one frame would alternately run ahead of and then behind the other. It was this action that caused some of the trucks to be considered unsafe for high-speed service. As a matter of fact safety at high speed is more important than the riding qualities.

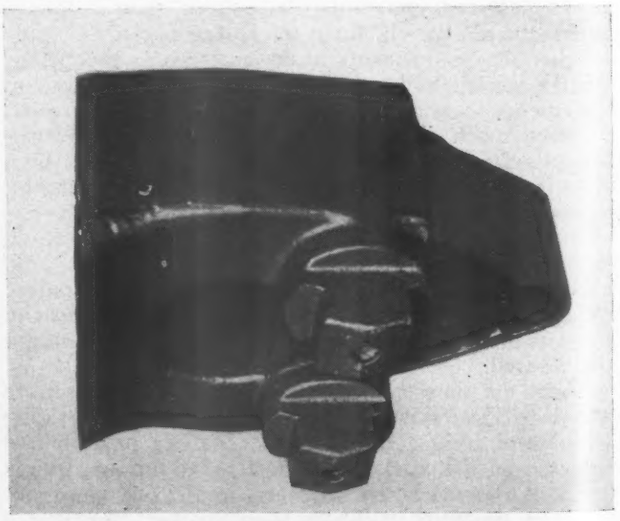
The ideal motion for a freight-car body to have would be one in which it moved along the track without change in vertical position. With irregularities existing in the track it is necessary for the springs to change deflection to accommodate them, and to get this ideal freight-car motion it would be necessary to have springs which could change their deflection without changing their capacity or force.

Since this is an impossibility the best that can be done is to design springs which have a force change as small as possible per unit of deflection. In other words, long-travel soft springs or springs with a low capacity per unit of deflection are essential in high-speed service.

It would seem that it should be comparatively easy to design a high-speed freight-car truck. For safety there should be some control to prevent see-sawing; for riding qualities an absorption device to control spring oscillations in conjunction with long-travel soft springs. However, it is impossible to secure the necessary softness of springs because of limitations in coupler height and the great variation in weight between an empty and loaded freight car. This puts a limitation on the riding qualities of freight-car trucks.

Limiting Factors in Design

The A.A.R. coupler-height range is between 34½ in. and 31½ in. above the rail. Because of wear and the settling of the car, the maximum spring deflection it is



Bottom view of the end of the bolster which shows the beveled nose design of the trunnions—These force friction wedges outward against split bushings

practical to use in freight-car trucks, is about 2½ in. This compares with 10 in. or more that is considered necessary to give a satisfactory ride in passenger cars.

Passenger-car trucks can get the necessary deflection because the load they carry is such a small proportion of the weight of the car. The load freight cars carry is several times the weight of the car and this prevents getting the desired deflection and staying within the required coupler heights.

The damage resulting from spring oscillation depends

on two things: the amount of the oscillation and the frequency of oscillation. The amount of oscillation can be controlled by some form of friction but the frequency depends only on the deflection or softness of the springs and the frequency varies inversely as the square root of the deflection.

Passenger-car truck springs with 10 in. deflection oscillate once per sec.; ordinary freight truck springs with ¾ in. deflection oscillate three and one-half times per sec.; high-speed freight truck springs with 2½ in. deflection oscillate two times per sec. A high-frequency spring produces a bad ride for two reasons: because it produces more oscillations per mile, and because each oscillation is more damaging than a low frequency oscillation.

A rather rough estimate of what might be expected from high-speed freight-car trucks would be that they should ride from three to four times better than ordinary freight-car trucks and four to five times worse than passenger-car trucks. All of these trucks should be assumed to have some means for controlling oscillations.

Design Features of Dual-Control Truck

The National Malleable and Steel Castings Company manufacture a high-speed freight-car truck. It is called the National B-1 truck with Dual Control and was one of the twelve trucks tested by the A.A.R. in the 1939 test and one of the seven that went through the complete test program. We have proceeded on the theory that a high-speed truck should retain the simplicity of the ordinary freight-car truck and have surpassed this simplicity because no spring planks or spring plates are required. Our high-speed truck in the 5½-in. by 10-in. size weighs 7,008 lb., when using one-wear rolled-steel wheels, and this is believed to be as light as any freight-car truck on the market.

We believe the first requisite of a high-speed freight-car truck should be safety and the second, riding qualities. The car must stay on the track of course, and while careful consideration should be given riding qualities, the coupler-height restrictions and the loads carried limit the results that can be obtained.

To change wheels with the National truck it is only necessary to raise the bolster, remove the brasses and wedges and tip the brake hangers out of the hanger brackets. The frames can then be spread and the wheels rolled out.

One of the illustrations shows a cross-section through the friction units, of which there are two per frame. The large trunnions cast on the bolster tie the frames together on the center line of the journals and eliminate the spring plank. It is not necessary to use spring plates to hold the springs in position, and the springs are protected from being driven solid.

The friction units consist of a split bushing, pressed into the frame and welded, and two wedges which seat on top of the springs. The wedges are forced against the bushings by the beveled nose on the bolster trunnions and the resulting friction controls the spring oscillations. The friction units have large bearing areas and also act as bushings to prevent frame and bolster wear.

The friction units not only control the spring oscillations which is necessary for good riding, but they resist unsquaring forces and make the truck safe for high speed operation, hence the use of the term "dual control." The entire weight of the car and lading tends to slide down the incline on the wedges and seek the center and the bottom of the wedge pocket. It is impossible to get the truck out of square without sliding the bolster trunnion up the wedge incline and raising the car.

Steel Dies From Scrap Locomotive Axles

Steel dies for the manufacture of many car parts are made from scrapped locomotive axles at an eastern railroad shop. Illustrated are dies for the manufacture of crossbearers used in the repair of high-side gondola cars. In making the dies a scrap locomotive axle was forged down to approximately the desired

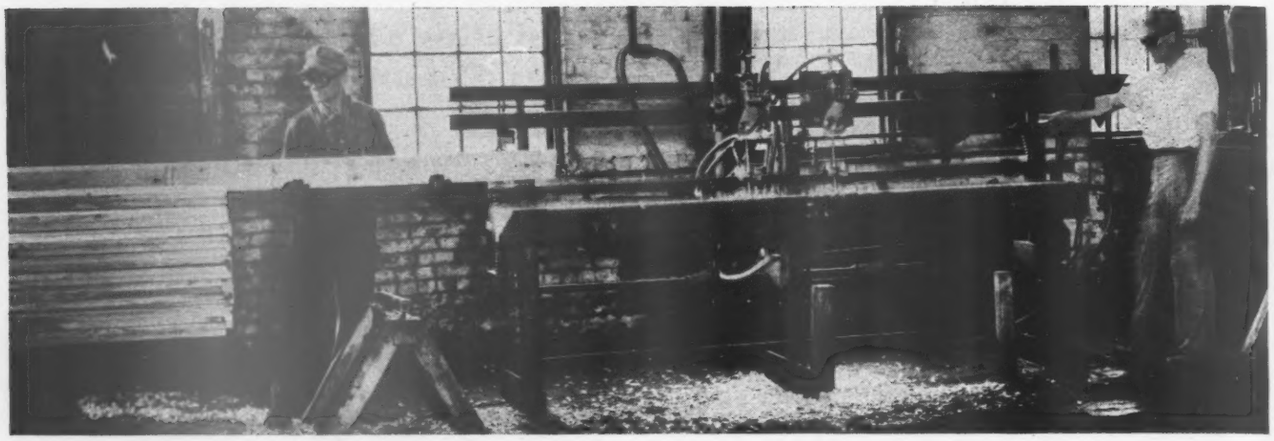
Steel dies for fabrication of crossbearers for a gondola car

dimensions and then the work was transferred to a planer for reduction to exact size. A template was made for use on an oxyacetylene gas cutting machine and, using it as a guide, a cut was made completely through the thickness of the metal. The kerf resulting from the flame cutting operation provided most of the necessary clearance between die faces. The final machining operations were completed on a shaper after which a backing plate was applied by welding to the female die. The dies were then drilled for application to the face plates of a bulldozer on which the crossbearers are made. Corners and other wearing surfaces of the dies are built up with a tool-steel welding rod applied by the arc-welding method. All surfaces are finish ground with a hand grinder.

Many thousands of crossbearers have been made with these dies and they are readily brought back to correct size by building up of worn surfaces by welding. They are not flame hardened but, in use, a service hardening occurs in the weld metal used on the wearing surfaces.

General Utility Sealing Compound

The Johns-Manville Co., New York, is marketing a non-hardening adhesive sealing and caulking compound under the trade name of Duxseal. Used like putty, the compound sticks readily to any clean surface without flowing, slumping or hardening in service, and is suited to a wide range of uses. It is insoluble in water, unaffected by ordinary gases and condensates, and does not injure the hands. It is in use in electrical, maintenance, mechanical, plumbing and other work. The compound is black in color and weighs 100 lb. per cu. ft.



Machine developed for boring floor boards at the McComb shops of the Illinois Central

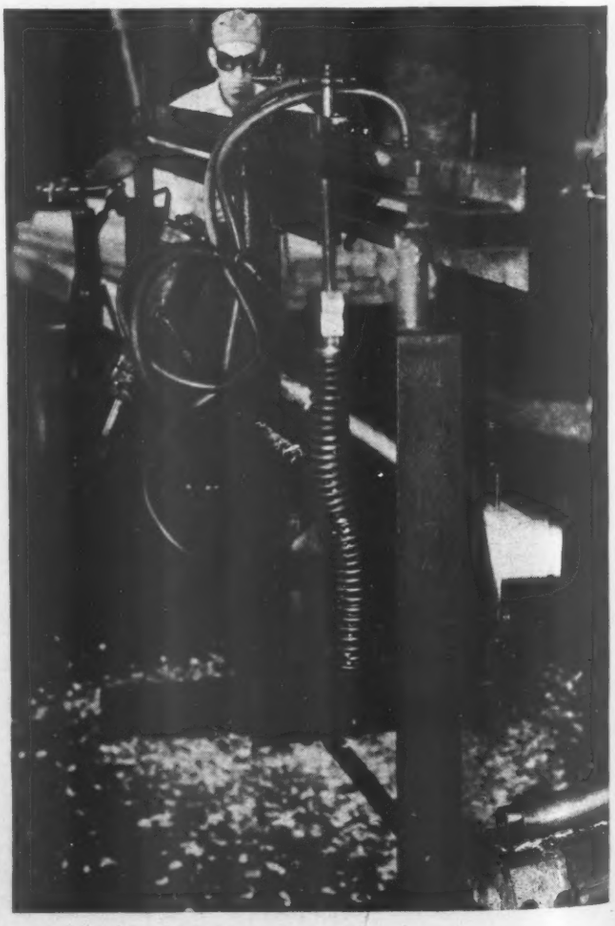
Boring Car Decking for Rivet Head Clearance

The machine for boring freight-car decking for rivet-head clearance, shown in the illustrations, was developed by E. L. Bowen, machinist, Illinois Central, McComb, Miss., who received an I. C. Suggestion Award of $200 for this proposed method of increasing efficiency and cutting car repair costs. Mr. Bowen's suggestion was one of 205 for which the Illinois Central awarded a total of $2,075 during the month of June.

Previous to the use of this machine at the McComb car shops, the floor boards in solid-bottom coal cars, for example, were gained by the use of one air motor, an apprentice and a helper finishing about 100 boards an hour. The machine illustrated was constructed to do this work at less expense and the present output is 200 pieces an hour. While the new machine increases job efficiency and reduces repair costs, its use also contributes to returning coal cars to service in less time than before, thus making more cars available for defense loads and assisting in the war effort.

Referring to the illustrations, it will be observed that the machine is made up principally of structural shapes, the frame consisting of three vertical angles in a row, held together by two tie rods with pipe spacers and having across the top two angles, one above the other, with the vertical flanges turned in opposite directions. On these angles are mounted two No. 262 Thor reaming motors in frames which permit them to be adjusted longitudinally to suit the spacing required. The spindles of the motors have been bored to suit wood bits and heavier springs applied to the governors to increase the speed to suit. Three angles are mounted below the motors, two of which act as a clamp for the decking. One of the latter is gibbed to the vertical members, to slide freely, and the other is attached to it by suitable brackets and small air cylinders which serve to clamp the decking. The lighter angle is attached to the one above it and serves to hold the guides for the bit centrally over the pieces to be bored. There is a shaft running lengthwise with arms that are attached by links to the clamp. At the back of the machine is a Shoemaker firedoor cylinder connected to a center arm of the shaft. This cylinder raises and lowers the clamp and is operated by the usual foot valve. Counterbalance springs reduce the load on the cylinder. One operating valve controls the motors and the air clamps. A lengthwise shaft underneath operates a stop at the end of the clamp.

The operation of the machine is as follows: the stop is thrown in place and two pieces of decking (faced in opposite directions) are shoved against it. The operating valve is opened and this clamps the material and starts the motors. The foot valve is depressed, which causes the clamp to raise and bore the pieces. The foot valve is released, the operating valve closed and the stop thrown out of the way, which lowers and releases the work, allowing it to be pushed out by the following pieces. A truck load of material is placed at the operating end of the machine and fed through, two facing pieces at a time, by the operator and removed and loaded on a truck by a helper located at the opposite end.



The back side of the machine

(*Turn to next left-hand page*)

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...means Conservation of Vital Metal!

A perfect wheel eccentrically mounted, will develop defects . . . shorten the life of rails, brake shoes and axles . . . and add considerably to machine shop time and cost.

Our Reseach Laboratory has developed a simple concentricity gauge. This device will be found invaluable in providing a positive check on wheel mounting practices. We'll be glad to send a description on request.

Our Booklet: "Wheel Shop Practice", will enable your men to do a better wheel shop job, assuring maximum life from Chilled Car Wheels, rails, brake shoes and axles. Copies may be obtained from our Chicago office without cost.

Under our wheel exchange plan, by which you receive new wheels for old on a conversion charge basis, your discarded Chilled Wheels are speedily smelted and recast into new and better wheels for freight cars.

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Railway Affairs . . .

Railroad Labor Shortage

Otto S. Beyer, director of the ODT Division of Transport Personnel, announced on November 15 that a survey of railroad labor conditions indicated that there was a "real and critical shortage of railroad labor." He suggested three measures to overcome this shortage—increased employment of women, centralization of personnel activities and modernization of training programs. The survey showed that 101 Class I railroads now employ about 40,000 women, of which 34,000 are engaged in clerical work. During the first World War the railroads employed approximately 100,000 women and Mr. Beyer suggested that they could probably employ a much greater number now. Of the roads reporting, almost half have no organized programs for training employees and many of the others have only very limited projects. Some roads have made special provision for training foremen and other supervisors in ways to break in new men assigned to work under them. One of these railroads is said to have 1,181 supervisory employees enrolled in such courses, given by federal and state agencies.

Eastman on Federal Operation of Railways

The program of the annual meeting of the Academy of Political Science was this year dedicated largely to a discussion of transportation in wartime. A program of this sort would necessarily include an address by Director Eastman of the Office of Defense Transportation. In explaining the steps that have been taken to avoid congestion at ports and elsewhere, Mr. Eastman told of the co-operation given to the railroads by shippers, the Army and Navy, the Shipping Administration and the ODT. Near the close of his address, in commenting upon the possibilities of federal operation of the railroads, he said: "The present co-operative arrangement is, I believe, working well, and certainly it is receiving loyal and wholehearted support from both the carriers and the shippers of the country. No one could wish for any better co-operation than I have received from both of these sources, and spirit and morale are at very high levels. Moreover, it is possible, through the present arrangement, to realize many of the advantages of unit operation, and the possibilities in this respect have by no means been exhausted. In the circumstances I can see nothing substantial to be gained by changing the arrangement, and I am also sure that if we were to embark upon a program of government acquisition and operation, it would have an immediate demoralizing effect which it would take some considerable period of time to correct, besides introducing many troublesome problems in connection with the acquisition and the compensation therefore, which would absorb the attention of many who now have none to spare."

Railroad Needs in The War Emergency

The Guaranty Trust Company of New York, in its monthly economic review in the Guaranty Survey, discusses the efficient operation of the railroads under private control during the present emergency, as contrasted with conditions during government operation in the first World War. In its opinion, it finds that the carriers have two outstanding needs: (1) That they should be provided with a sufficient supply of materials and equipment to continue the excellent record of service they have thus far maintained (the present transportation situation in Germany was held up as evidence that there are few needs more urgent than that of keeping the rail transport system at the peak of efficiency), and (2) that they should be permitted to retain a sufficient portion of their earnings to sustain credit, encourage adequate maintenance of facilities and to bolster their financial position, which still shows the effects of long years of reduced income. It was the opinion of the Survey that railway labor, shippers groups and public authorities have too often been inclined to seize upon any increase in railway earnings as an opportunity to make new financial demands on the carriers.

Jeffers Comments on Labor and Management

W. M. Jeffers, president of the Union Pacific and national rubber administrator, is noted for speaking frankly and straight from the shoulder. With his direct businesslike approach he has done much in a few short weeks, to bring order out of chaos in the rubber situation. In discussing another phase of our economic life and one in which he is well versed, "Men and Management in America," he made the following statement before the New York Herald-Tribune Forum on November 16: "Management has been short-sighted in the exertion of its power in times past when it should have elected to guide rather than to rule. Labor has been equally as short-sighted when it tasted new-born power in recent years and in misguided efforts to protect its gains, particularly in the past few months, has risked the good will of the public. These things must pass in order that we may win the victory and must permanently be discarded if we are to win the peace."

Post-War Planning

If much thinking and planning to meet post-war problems can be helpful, then certainly the aftermath of the present world conflict should be very different from that of the first World War. Ralph Budd, in speaking before the recent meeting of the American Railway Bridge and Building Association, said that, "A word should be said about the prospect of the railways after the war and what, if anything, can be done at this time about them. . . . I am one of those who believe that the expenditure of funds by government can never take the place in a free society of the very much larger expenditures which free enterprise can produce. . . . The railroads will not lag in the initiative and ingenuity to take care of themselves if they are given the proper atmosphere of regulation. For the time being we have had to give up a great many technological advances and advantages because certain materials are not obtainable, but immediately when they become available again, we will start where we left off, or perhaps a little further along, and I venture to say that there will be no lack of projects and no lack of employment and productivity, if we are given the proper support from those under whom we must work."

The Oil Movement To the East Coast

Several factors combined to slow up the movement of petroleum and petroleum products into the eastern states after the high record was reached of 856,710 barrels a day during the week ended September 19. Director Eastman, in speaking before a meeting of the American Petroleum Institute in Chicago in mid-November, said that he had not lost hope that the movement would be increased to over 850,000 barrels per day. He pointed out several favorable factors. He then listed the unfavorable ones as "the coming winter, which will slow traffic, particularly if the weather is severe; the strain on railroad motive power of increasing war traffic and troop movements; and the condition of the cars." The ODT has appointed a maintenance committee, which is surveying the physical condition of tank cars transporting petroleum into the East. It has been asked to determine the adequacy of repair facilities, considering the location of shops, class of repairs, supply of labor, availability of materials and other factors; also to report on current methods of inspection and running repairs, making recommendations for improvements. It is also giving consideration to the possibility of establishing general repair shops or shops for light and medium repairs at or near major points of origin and destination.

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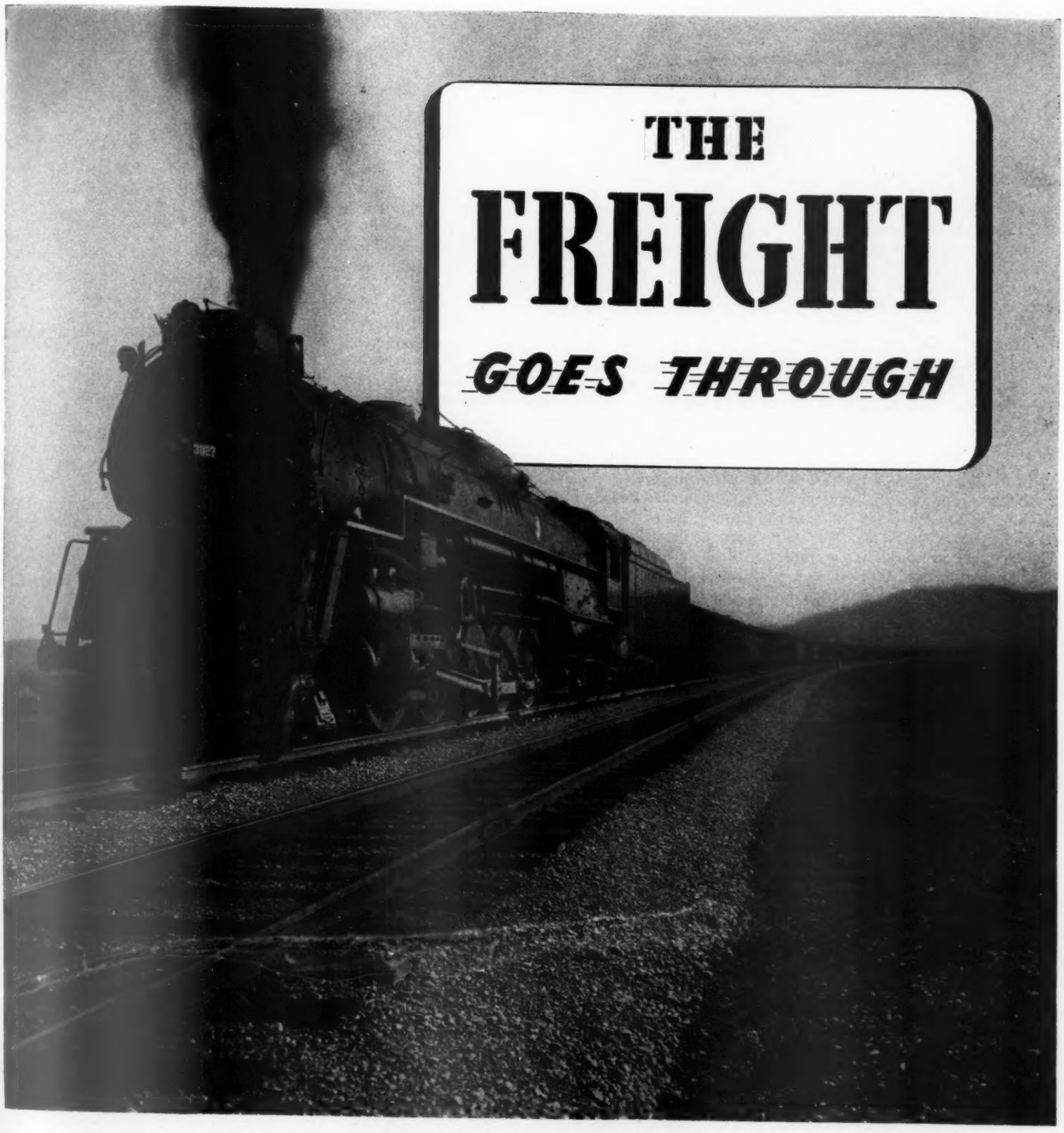

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NEWS

AA-1 Priority for Repairs and Maintenance

THE War Production Board's Requirements Committee on November 11 authorized that the top priority rating of AA-1 may be applied to essential repair and maintenance. Included in the scope of the determination, "a basic policy for the first quarter of 1943," are "transportation systems," which are listed among industries to be "assured of materials to keep them performing their essential functions."

WPB Revises Steel Restrictions

REVISED iron and steel conservation order M-126, announced by the War Production Board November 5, includes some minor changes that affect the use of iron and steel, including stainless steel. The use of iron and steel is entirely prohibited for a long list of new items, but an exception is provided for the delivery of roofing and siding "for the maintenance and repair of railroad freight cars, street cars, and buses." Lead is no longer included in the list of materials that may not be substituted for iron and steel.

WPB Advises on Car Designs and Steel Plates

MAKING "a further effort to simplify various designs of freight cars for general service," the Transportation Equipment Branch of the War Production Board has requested car builders to restrict to seven designs their production of gondola, hopper and flat cars for general service under Limitation Order L-97-a. The request came in a letter from Branch Chief Andrew Stevenson, who has also recently advised that the steel-plate situation has changed to permit removal of the restriction to plates not more than 48 in. in width.

The car designs suggested in the letter to car builders are as follows:

Gondola Cars

Drawing No. 5-1918—50-ton composite gondola—41 ft. 6 in. inside length.
Drawing No. 5-1919—50-ton composite gondola—41 ft. inside length, 16 steel drop doors, steel fixed ends.
SK-F-5163-C—70-ton composite gondola—52 ft. 6 in. inside length, low side and steel drop ends.

Hopper Cars

SK-7-13-42-B-B—50-ton composite hopper—33 ft. inside length.
SK-7-13-42-C-B—70-ton composite hopper—40 ft. 8 in. inside length.

Flat Cars

Drawing No. 510-F-54-A—50-ton flat cars—53 ft. 6 in. length.
Drawing No. 17592—70-ton flat cars—53 ft. 6 in. length.

The announcement said that these designs were discussed at a meeting of WPB officials and car builders, adding that "designs for composite type box cars are under consideration and will be announced within the near future."

The statement with respect to steel plates recalls that for the past several months "restrictions have been in effect providing that plate for railroad maintenance and repair, for car construction and for locomotive construction be limited to not more than 48 in. in width except for firebox and boiler steel, for certain tank-car construction and for bridges and turntables." It goes on to advise that conditions now permit modification of the restriction to allow use of plates not wider than 72 in., adding that plates are most readily available "in widths ranging from 36 to 72 in., inclusive, when they can be ordered in quantities of not less than 10 tons of an item and in carbon steel of structural grade."

Thus, it is suggested that "every effort be made to consolidate orders," and attention is called to the fact that in many cases the mills can avoid delay in shipment if authorized to substitute Bessemer for open-hearth steel. The restriction to not over 72 in. does not apply to firebox and boiler steel, steel for high pressure tank cars, or for bridges and turntables.

* * *

Charles E. Brinley, president of the Baldwin Locomotive Works, alighting from the cab of one of the new Pennsylvania Class T-1 locomotives—During a recent trip to Chicago Mr. Brinley boarded the cab of Locomotive 6111 at Crestline, Ohio, and rode to Fort Wayne, Ind., a distance of 131 miles, to observe the performance of these 4-4-4-4 type passenger locomotives built by Baldwin

WPB Equipment Allotments Disappointing

PROSPECTS for obtaining what the railroad industry regards as adequate new equipment for 1943 now rest on the hope for later readjustment of the present eight-months' authorizations for 250 steam locomotives and 36 road Diesels, and the six-months' authorizations for 100 Diesel switchers and 20,000 freight cars. Projecting these figures on an annual basis would indicate a 1943 program calling for 629 locomotives, 271 fewer than the 900 sought by the railroads, and 40,000 cars, or just half of the 80,000 requested. As had been anticipated, no new passenger car production was authorized. Meanwhile, the authorizations of steel for maintenance of way and equipment have been appraised in railroad circles as fairly adequate. These steel allotments, all for first quarter delivery in 1943, are: rail, 480,000 tons; track accessories, 288,000 tons; repairs to equipment, 330,000 tons. On an annual basis, these would indicate 1943 totals as follows: rail, 1,920,000 tons; track accessories, 1,152,000 tons; repairs to equipment, 1,320,000 tons.

The authorizations determined recently by the War Production Board's Requirements Committee were announced on November 19 following a meeting at which Andrew Stevenson, director of WPB's Transportation Equipment, outlined the program to his Transportation Equipment Industry Advisory Committee, consisting of builder and railroad representatives. That meeting was followed by other sessions at which determinations were made as to the allocation of production among contract-builder plants and railroad shops.

The railroads' immediate reaction was one of disappointment in the equipment authorizations, the disappointment finding expression mainly in comments on the locomotive program, for while there was no satisfaction with the car program either, it was pointed out that cars are of little use in a period of motive-power shortage. It is understood that the locomotive program finally recommended by Director Eastman of the Office of Defense Transportation and the Association of American Railroads' presentation calling for 900 were not far apart. And while the A. A. R. presentation was on an October-to-October basis as compared with the calendar-year-1943 basis of the authorizations, the carry-over balances out to make substantially correct the above statement to the effect that if the present authorizations are carried forward on nothing more than a pro-rata basis, the locomotives forthcoming during the next year will be 271 short of the estimated requirements.

In other words, the eight-months' program for 250 steam locomotives and 36 road Diesels would, if extended for 12 months, bring 125 more of the former and

(*Continued on next left-hand page*)

how to help us serve the RAILROADS better

Franklin Railway Supply Company is 100% in war production. Part of this consists of supplying the railroads' needs and the remainder is on direct war contracts.

To insure prompt delivery of repair parts Franklin needs the railroads' help.

here's how

1. Make application for the highest priority to which you are entitled. If this is not received with your order we must ask for an amendment. This means delay in shipping the needed parts.

2. The ordering of small numbers of frequently used repair parts wastes man-power and machine time. Order parts in reasonable quantities. Not more than you require for a normal inventory but not by twos and threes.

Large numbers of small individual orders slow up the supply of everyone's needs. Alterations must be made in machine settings, dies must be changed, thereby slowing down the whole production operation. Purchasing of fabricating materials in small quantities further complicates and delays deliveries.

3. Another procedure that delays deliveries is the ordering of parts that are not within the range of the standard dimensions. A sufficient range of sizes is provided for every repair part to cover 95% of the railroads' requirements. Ordering parts with dimensions outside these standards not only slows production of other repair parts but results in delay in obtaining the special part.

By cooperating in these three requests the railroads are enabling Franklin not only to supply them with parts more promptly but to step up the tempo of Franklin's contribution to the war effort.

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In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

18 more Diesels, or totals of 375 and 54, respectively, mentioned at the outset. Likewise, the 100 Diesel switchers authorized for six months would become 200 for the year. Hence, a 12-months' program for only 629 locomotives as it is indicated at this time. The Diesel-switcher situation is causing some concern, for the authorization in that connection is reported to represent a drastic cut under the railroad proposal. It has been suggested, however, that switcher production from the 250 steam locomotives authorized might bring some relief.

With respect to the car program, all 20,000 will be open tops. While Director Stevenson's meeting with his advisory committee was not open to the press, it was learned that the discussions there included considerable talk about standardization of designs and concentration of construction. As noted elsewhere in these columns, the Transportation Equipment Division recently requested car builders to restrict to seven designs their production of gondola, hopper, and flat cars for general service under Limitation Order L-97-a. The 1943 car program recommended by ODT to WPB was not made public, but it is reported to have called for between 73,000 and 74,000 cars as compared with the railroad request for 80,000.

WPB's November 19 announcement of the authorizations said that its action would enable railroads "to place promptly the major portion of their orders for rails and equipment to assure delivery on schedule." Ferdinand Eberstadt, WPB vice-chairman in charge of program determination, appeared at the advisory committee meeting and is reported to have told the builder and railroad representatives that they had the "green light" to go ahead on the authorized program. In other words, it was emphasized that the necessary materials would actually be forthcoming under allocations.

It was also pointed out at WPB that the new Controlled Materials Plan (see page 546) which is being launched on a gradual basis to become fully effective next July 1, embodies procedures for resurveys and redeterminations of programs on the basis of new developments in the materials situation. Under such a set-up, the railroad industry would seem to have some basis for hope in recurrent reports to the effect that the next six months will bring an easing of the steel situation.

Such reports are based on the fact that substantial non-recurring demands for steel used in war-plant construction are well on the way to satisfaction. These include plants now building for the production of synthetic rubber, aviation gasoline, and aircraft engines. It has been suggested at WPB that as those facilities are completed —and they are reaching that stage—more steel should become available for other allocations. Also, there has been some thought that the African campaign, though it brings new army demands for rolling stock, might nevertheless make a substantial net contribution to an easing of the over-all steel situation, if one result should be such a shortening of United Nations' communications lines as to alter conditions with respect to steel required for shipbuilding.

Previous to the above announcement from Washington, the minimum equipment requirements of the railroads were placed at 1,000 locomotives, 100,000 freight cars and 2,000,000 tons of rails, by Ralph Budd, president of the Chicago Burlington & Quincy; Henry A. Scandrett, trustee of the Chicago, Milwaukee, St. Paul & Pacific, and Arthur H. Schwietert, traffic director of the Chicago, Association of Commerce, representing the shippers, in a round table discussion of Our Astounding War Transportation Machine, conducted by the Union League Club of Chicago on October 29. The discussion, over which Samuel O. Dunn, chairman of the Simmons-Boardman Publishing Corporation and editor of the Railway Age, acted as moderator, was attended by 700 representatives of the railroads, the shippers and the public.

The equipment needs of the carriers are also stressed by the Transportation and Communication Department Committee of the Chamber of Commerce of the United States in a report on "Transport Conservation," recently prepared by the committee and approved by the Chamber's board of directors. This report urges upon the War Production Board "special consideration of the need for a proper balance between production and transportation, in allocating materials for transportation equipment and maintenance, even though this may require materials that would otherwise go into war equipment.

Railway Activities of Engineers Corps Transferred to Transportation Corps

ALL Army activities connected with the operation and maintenance of railroads, which were formerly a function of the Corps of Engineers have been transferred to the Transportation Corps, Service of Supply, according to a November 16 announcement from the War Department. Included in the transfer is the Military Railway Service, headed by Brigadier General Carl R. Gray, Jr.

The Transportation Corps, headed by Major General Charles P. Gross, was created last August "to co-ordinate, direct, and speed the flow of men, equipment, and supplies into the war effort." Its new jurisdiction over the Military Railway Service will be complete, the November 16 announcement said, covering that Service's engineer headquarters and headquarters companies, all grand divisions, all operating and shop battalions, and all other units and reserve components.

"Many installations and large numbers of Army personnel," the announcement also said, "are involved in this move for the centralization of control over military transportation. All activities and installations permitting to research, design, development, procurement, storage, and distribution of railway rolling stock for the War Department, which were formerly under the jurisdiction of the Corps of Engineers are included in the transfer." Meanwhile, however, new railway construction for the Army will continue to be the responsibility of the Corps of Engineers.

Among the military personnel affected are "all officers of the Corps of Engineers or other components of the Army whose primary assignments were in connection with the transferred activities." In addition to the personnel of the Military Railway Service, these include personnel of the Railway Branch, Troops Division, and the Railway Equipment Section, Procurement Branch, Supply Division, Office of Chief of Engineers. Civilian personnel engaged primarily in the transferred activities have also been placed under the jurisdiction of the Transportation Corps.

Brazilian Train Uses Diesel Oil from Coal Deposits

A DIESEL train of the Central Railroad of Brazil recently completed a round trip from Rio de Janeiro to Sao Paulo using Diesel oil extracted from bituminous deposits from the State of Rio Grande do Sul. The new motor fuel is said to have given ample satisfaction. Brazilian coal, on the whole, is of lower grade than the imported coal on which Brazil formerly depended.

Training Workers in the Care and Use of Carbide Tools

THE Carboloy Company, Inc., Detroit, Mich., has developed a series of six 35 mm. silent slide films designed to expedite the training of new workers in the use, care and handling of carbide tools. The films are based largely on experience gained over several years in the operation of a training course at the Carboloy plant in Detroit and are being distributed at print cost for use as a permanent part of war-training programs by industrial concerns and education institutions, etc. Arrangements are also being made for free loaning to educational institutions through film libraries maintained by colleges. The films depict cemented carbide; designing and brazing cemented carbide tools; chip breakers and their application; grinding single-point carbide tools, and putting cemented carbide tools to work.

WPB Office of Production Research and Development

CHAIRMAN Donald M. Nelson of the Office of War Information, War Product Board, has announced the establishment of an Office of Production Research and Development in the War Production Board, with Dr. Harvey N. Davis, president of the Stevens Institute of Technology as its director. The office has been set up to insure rapid appraisal and the quickest and most effective utilization of processes, materials, mechanisms, and inventions in the production of war goods. It will parallel in the production field the work already being done in regard to instruments of war by the Office of Scientific Research and Development. Its four principal functions will be:

(1) To provide the chairman with technical information on problems with which he is directly concerned and on research and development work in progress in WPB. The office is also to provide the WPB divisions and branches

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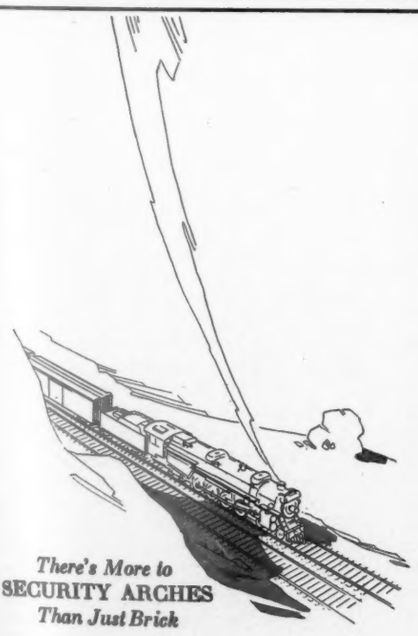

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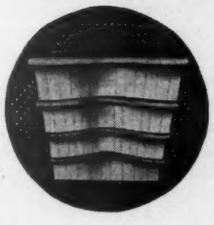

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with research information and findings on work which they have in progress.

(2) To initiate evaluation and analysis of specific scientific or technological proposals, through the establishment of export committees or through reference to existing research groups in government, education, or industry.

(3) To get needed research accomplished by contracting with outside laboratories or agencies for experimental work.

(4) To bring about development of such projects or processes as are found to merit it, through contracting for the construction of prototypes or the erection of pilot plants.

Except for contracts connected with the rubber program, all contracts for research and development work by other governmental agencies, colleges and universities, commercial laboratories and corporations, and others will be handled by Director Davis who will consult with the WPB Director General for Operations and with the head of the branch or division involved before undertaking any program.

WPB Critical Materials • Control Plan

THE new Controlled Materials Plan (CMP) adopted by the War Production Board to adjust requirements for critical materials to the available supply will, according to WPB Chairman Donald M. Nelson, "insure the railroads in getting their proper proportion of materials essential to do their job" at the time they are needed.

The new plan will become fully operative next July 1, but it will gradually become effective in different industries before then as they are ready for it, replacing the present priority system. Mr. Nelson mentioned the railroad industry as one that would "go ahead very fast" under the new control mechanism.

The critical materials to be controlled under the new plan from the start are aluminnm, copper, and carbon and alloy steels. It is expected that other materials may be added to this list later, but these three are regarded as key materials, the allotment of which will in large measure establish control over all industrial production.

As far as the three affected critical materials are concerned, the new plan succeeds other distribution systems by which WPB has sought without complete success to balance supply and demand.

The CMP program is based on a "vertical allotment" method of distributing materials, in which seven "Claimant Agencies" become in effect the distributors of all the available supply of the three critical materials, allotting their shares of the supply to prime contractors producing essential goods, who in turn divide these allotments with their suppliers and subcontractors. The process of division may be carried on as far as the chain of subordinate contractors extends in an individual industry, arriving in the end to the supplier of the raw materials.

The seven Claimant Agencies set up under the plan the the Army, Navy, Maritime Commission, the Aircraft Scheduling Unit (in which is consolidated material control for all aircraft production), Lend-lease, Board of Economic Warfare, and Office of Civilian Supply. The latter office, which is the claimant agency for all producers not otherwise represented—including producers of railroad materials and equipment—will assemble its estimates of requirements with the aid of the various WPB industry branches.

According to Leon Henderson, director WPB, Office of Civilian Supply, the more essential "civilan" products, including railroad equipment and materials, will get relatively larger allotments of the controlled scarce metals, but, in his words, his agency, in programming the quantities needed of "end-products"—railroad cars, for example—will "not sell tickets for more seats than there are in the theater."

To give the WPB industry branches "greater strength" to handle the job of informing the Office of Civilian Supply on the resources and needs of each industry, Ferdinand Eberstadt's office of rogram determination is reorganizing them, it was announced on November 3. To as great an extent as possible, each industry branch will follow a similar pattern.

Functioning of the new CMP through the Office of Civilian Supply will follow in a general way the pattern of present operations, Mr. Henderson explained, but three new factors have been introduced: Bills of materials, allotment numbers, and inventory control. Under the new plan prime contractors will prepare and submit a breakdown of all materials required for the "end-products" they are producing. This breakdown will constitute a bill of materials which will specify what materials are required and when they must be received.

All bills of materials will be assembled periodically by the Office of Civilian Supply and the other six Claimant Agencies and submitted to the WPB Requirements Committee, indicating separately requirements for production, for construction, and for maintenance and operation. It is intended that such programs shall be worked out and requirements submitted on a quarterly basis for a period of 18 months in advance. Requirements for construction, including industrial machinery and equipment, will be handled through a special channel, the Construction and Facilities Branch of the Office of Program Determination.

The assembled statements of requirements will pass through Controlled Materials Branches—one for each of the materials alloted under the new plan—which will "make the necessary adjustments" to bring requirements into balance with available supplies. When the programs of the Claimant Agencies have been adjusted and approved, the vice-chairman in charge of program determination will, with the advice of the Requirements Committee, of which he is chairman, allocate the available supply of the controlled materials to the seven Claimant Agencies. These agencies then will distribute thse allotments among their prime contractors by means of allotment number, "which will constitute a right to receive delivery." These allotment numbers will be passed on from contractor to subcontractor to supplier as necessary.

Materials other than the three controlled materials will continue to be distributed through the priorities system unless the CMP is extended to cover them later. Each producer receiving an allotment number will receive also a preference rating for obtaining other materials, and these preference ratings will "resolve conflicts" in the production and delivery of manufactured articles.

The first bills of materials will be assembled by the Claimant Agencies between now and January 1, so that they can at that time "program the quantities of end-products"—such as freight cars—most urgently required and submit a consolidated estimate of materials needed to the Controlled materials Branch. On February 1 the Requirements Committee will allot controlled materials to each Claimant Agency for the second quarter of 1943. Distribution of allotments through contractors and suppliers will follow, and by March 15 users will have placed orders for delivery in April and later months, according to the CMP timetable.

In addition to the controlled materials, the scarce materials include such metals as zinc, tin, nickel and cadmium, and also a variety of raw materials, including rubber, cordage fibers, rayon, mica, nylon, and wood.

Separate classifications are provided for many shapes and forms of these scarce and controlled materials, so that the steel product classification includes among others rails and track accessories, steel castings, wheels and axles, structural shapes, and sheets and plates. Code numbers are specified for including each of this large variety of shapes and qualities of material in the bills of materials required from each producer.

Tank Cars Should Get Steel Wheels

THE A. A. R., Mechanical Division, reports in a recent circular letter to the members and to private tank-car owners that tank-car repairs and maintenance were thoroughly dicussed at a meeting of the Tank Car Service Executive Committee, Office of Defense Transportation, held at the William Penn Hotel, Pittsburgh, Pa., on Wednesday, September 16, 1942. At this meeting a resolution was passed to the effect that, in co-operation with the A. A. R., all car owners and carriers be urged to expedite the application of truck-spring snubbers and the substitution of wrought-steel wheels for defective cast-iron wheels to tank cars, as expeditiously as available material will permit.

A representative of the Office of Defense Transportation advised those present that the ODT would give every assistance possible for procuring material necessary to accomplish these applications as soon as possible, so that lost time due to tank cars out of service for repairs will be reduced.

In event the application of one-wear wrought-steel wheels is authorized by the car owner and such wheels are not available, railroads and car owners are requested to apply new cast-iron wheels (if available) in place of defective wheels. When wheels are renewed in kind, railroads and car owners are requested to apply new wheels so far as possible, whether or not owners or delivering-line defects are involved.

Private tank-car owners are requested to advise promptly if they will authorize railroads to apply one-wear wrought-steel wheels (preferably new), or new cast-iron wheels, where available, in place of defective wheels, without penalty, irrespective of owners or handling line defects, billing them for the betterment charge involved, in accordance with the allowances shown in the interchange rules.

The ODT has requested that it be advised currently the number of cars equipped with spring snubbers, this information being furnished through the medium of monthly reports to the A. A. R., Mechanical Division. The ODT also advises that their service representatives have found that some of the inspections being made by the tank-car companies at the unloading racks are not as complete as they should be, and in some cases inspectors are not used on all three shifts. This allows some tank cars to be unloaded and returned to the railroads for empty movement without any inspection. Each tank-car owner is requested to make investigation at its unloading points, and if any of them are not equipped to make inspection, necessary arrangements must be made so that all cars will receive proper inspection and repairs before they are placed in trains for movement.

This co-operation is earnestly solicited to the end that the flow of petroleum products to the eastern seaboard may be expedited.

A. A. R., Mechanical Division

Conservation of Rubber

In a recent circular letter, the Mechanical Division, through its Committee on Brakes and Brake Equipment, has approved and recommends the following specifications for the reconditioning of used gaskets to conserve the rubber required in manufacturing these gaskets:

The gaskets to be treated under this specification are only those which have been removed from valves returned for cleaning, and which are to be replaced in valves for continued service.

The object of this treatment is to clean the gaskets, to restore their flexibility, and to restore the height of the beads, so that they will form a better seal when they are reassembled.

The gaskets shall be immersed in a tank of boiling water for one hour. After this period they shall be laid on a bench and the excess water wiped off with a cloth. The gaskets shall then be brushed with a soft bristle brush (such as a shoe brush) to remove any remaining dirt and to polish them.

After this treatment the gaskets shall be assembled in valves as soon as possible instead of being stored.

Car Equipment Delayed Awaiting Repair Materials

In another circular letter the Mechanical Division points out that excessive delays are being experienced in making repairs to freight and passenger cars on foreign roads, where necessary to order repair material from owner and requests are transmitted by mail. This is particularly true where shops of the car owner and the repairing line are separated by a considerable distance.

Due to the urgent demand for passenger, tank and open-top cars, when necessary to request material for repairs to such foreign cars from car owner, orders should be transmitted by telegraph, telephone, or air mail, and material forwarded the same day if possible. Any material weighing less than 250 lb. gross weight must be shipped by express, as specified in Rule 122.

The same method of handling requests for material should be followed between the repair point where a car is held and the office of the repairing line which transmits such requests to the car owner. The letter emphasizes the importance of this matter under present conditions and urges that it be brought to the attention of supervisors and all others concerned, in order to avoid all possible delay in returning cars to service.

1941 Proceedings

The Proceedings of the Mechanical Division session held at the Jefferson Hotel, St. Louis, Mo., June 19-20, 1941, are available through the Association of American Railroads, Operations and Maintenance Department, 59 East Van Buren street, Chicago, at a cost of $4 to members; $8 to non-members. They contain 466 pages and include the reports of committees and discussion at that annual meeting and the recommendations of committees submitted to letter ballot of the members by authority of the General Committee.

Beyer Urge Labor Training Programs

A survey of railroad labor conditions has disclosed that on 101 Class I railroads there were 60,000 vacant jobs on September 15, Otto S. Beyer, director of the ODT Division of Transport Personnel announced November 15. This figure, he explained, does not mean that there were actually 60,000 vacancies that could not be filled, since it includes the normal turnover of employees that accounts for a substantial number of vacancies on any given day, but, he added, it does "reveal a real and critical shortage of railroad labor. Responses to the survey, moreover, specifically indicate that the carriers are encountering extreme difficulties in meeting many shortages."

Mr. Beyer called upon the railroads to adopt three measures to meet this growing problem of labor shortage—increased employment of women, centralization of personnel activities, and modernization of training programs. Of the 101 Class I roads reporting in the survey, 47 have absolutely no organized programs for training employees, he said, and many of the others have only very limited projects.

The survey indicated that the railroads are meeting particular difficulty in filling apprentice jobs, as eligible young men show little interest in a long apprenticeship when an abundance of well-paying jobs are available and induction into military service is more or less imminent.

Some railroads have met with success in instituting training programs, the survey disclosed, and others are now engaged in overhauling their methods to meet current conditions. While such training programs seldom include formal classes for the instruction of new employees, it was pointed out that the traditional on-the-job training procedures have been accelerated and modified. On some roads special courses have been set up to train foremen and other supervisors in ways to break in new men assigned to work under them. One railroad was said to have 1,181 supervisory employees enrolled in such courses, given by federal and state agencies.

Milwaukee Broadens Safety Work to Conserve Manpower

A program of accident prevention which concentrates upon the proper training of employees as a means of conserving manpower and insuring the continuity of the railroad's war efforts has been adopted by the Chicago, Milwaukee, St. Paul & Pacific. To carry out the program, eight newly appointed district safety engineers have each been assigned territories and will be held responsible for the training and safety of employees in their districts.

Men for the newly created position were selected from supervisory ranks on the basis of their accident records as supervisors, their activities among employees and recommendations of superiors. Under the program they will be in direct contact with all branches of railroading in their districts, will train supervisors, will spend time on the line checking performance and will attend all employee meetings.

The eight new district safety engineers and their headquarters are as follows: Otto C. Stainer, Chicago, formerly a freight service inspector; William A. French, Milwaukee, Wis., formerly a machine shop foreman; Roy A. Dahms, Milwaukee, formerly a general track foreman; Clifford W. Riley, Ottumwa, Ia., formerly a conductor; Martin L. Medinger, St. Paul, Minn., formerly a boiler shop foreman; Frank M. Washburn, Minneapolis, Minn., formerly a general car foreman; H. J. McMahon, Miles City, Mont., formerly a superintendent's chief clerk; and T. E. Corbett, Tacoma, Wash., formerly a chief dispatcher.

WPB's Railroad Salvage Director Gets New Title

B. C. Bertram is now chief of the Railroad Unit, Conservation Division, War Production Board, his title having been changed from that of salvage director for railroads.

American Steel Foundries Armor Plant Producing

Ceremonies marking the opening of the new cast armor steel foundry of the American Steel Foundries at East Chicago, Ind., were held on October 29. Addresses were

(*Continued on second left-hand page*)


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T.R.A.
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Average revenue carloads handled monthly by the Terminal Railroad Association of St. Louis in 1938 to May 1942.
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Two
GM DIESEL SWITCHERS
DELIVER VICTORY TRANSPORTATION
Because They
• Speed yard movements with safety and minimum damage to lading and equipment
• Reduce operating costs 50 per cent
• Reduce fuel expenses 75 per cent
• Operate at 94 per cent availability
• Conserve equipment — GM locomotives in all classes of service are replacing two to four times as many steam locomotives, thus releasing hundreds of steam locomotives for other important services
• Conserve vital materials — One ton of materials in a GM Diesel will do the work of more than two tons of materials in a steam locomotive.
TRANSPORTATION IS VITAL FOR VICTORY
GENERAL MOTORS
LOCOMOTIVES
554
ELECTRO-MO
GENERAL MOTORS CORPORATION

...se and No Bottlenecks

...t. Louis Keeps Heavy Traffic Moving WITH DIESEL SWITCHERS

IN the four years, 1938 to 1942, the average revenue carloads handled monthly by the Terminal Railroad Association of St. Louis increased 100 per cent from 75,340 to about 150,000 cars. The average time on all cars handled in interchange by the T. R. R. A. has also been reduced to under eight hours, as compared with an average of 12 hours only a few years ago. This is the kind of transportation efficiency which spells VICTORY.

Two major factors have made possible this efficient and successful operation—intelligent supervision and the installation of 28 Diesel switchers, of which nine were built by General Motors.

The foresight of the T. R. R. A. management in purchasing these Diesels has eliminated any possibility of a power shortage, which would seriously interfere with its operation. By continuing the present efficiency in locomotive utilization, they will have sufficient power to handle the heavier traffic which is inevitable.

MORE THAN EVER BEFORE—WE MUST KEEP 'EM ROLLING

...O'VE DIVISION

LA GRANGE, ILLINOIS, U. S. A.

made by Thomas Drever, president of the company, and Brigadier General Donald Armstrong, chief of the Army's tank automotive center at Detroit, Mich. The new plant, one of the largest steel foundries in the country, was built to meet the demands of the combat section of the Army Ordnance department for a large tonnage of cast armor for tanks. The project was a co-ordination of the engineering skill of the personnel of American Steel Foundries and agents of the Defense Plant Corporation which furnished the necessary funds of $26,500,000. In less than one year from the time when architects and engineers were instructed to prepare plans, a heat of cast armor steel was poured into molds.

Alco Sponsors Diesel Shop Battalion

THE American Locomotive Company recently sponsored the 762d engineer railway Diesel shop battalion, United States Army, following an invitation to the company to do so from the corps of engineers. The suggestion that the company sponsor the battalion was first made to Duncan W. Fraser, president of the American Locomotive Company, by Colonel Lewis T. Ross of the railway branch, troops division, corps of engineers, and Mr. Fraser agreed to the recruiting of personnel from all phases of the company's operations, including clerical help, in order to insure that there would be in the unit complete familiarity with every aspect of Diesel locomotive maintenance. Major William Rogers, formerly a district service engineer for the American Locomotive Company, is senior officer in the battalion, and others who have accepted commissions are Captain George F. McGowan, formerly a survey engineer, and Lieutenants Charles C. Davis, John D. Coleman, Myron A. Tenney and W. E. Sagstetter, all of whom were Diesel service engineers. Other personnel was drawn from the General Electric Company, the Westinghouse Air Brake Company and the Exide Battery Company. In each instance the men selected were specialists in some phase of Diesel engine maintenance. The battalion was recently activated.

Selective Service Rates Equipment Building as "Essential"

THE Selective Service System has issued Occupational Bulletin No. 38, calling to the attention of local draft boards a War Manpower Commission certification that the production of transportation equipment is an activity essential to the support of the war effort. The bulletin lists 88 "critical occupations" in the equipment-building industry.

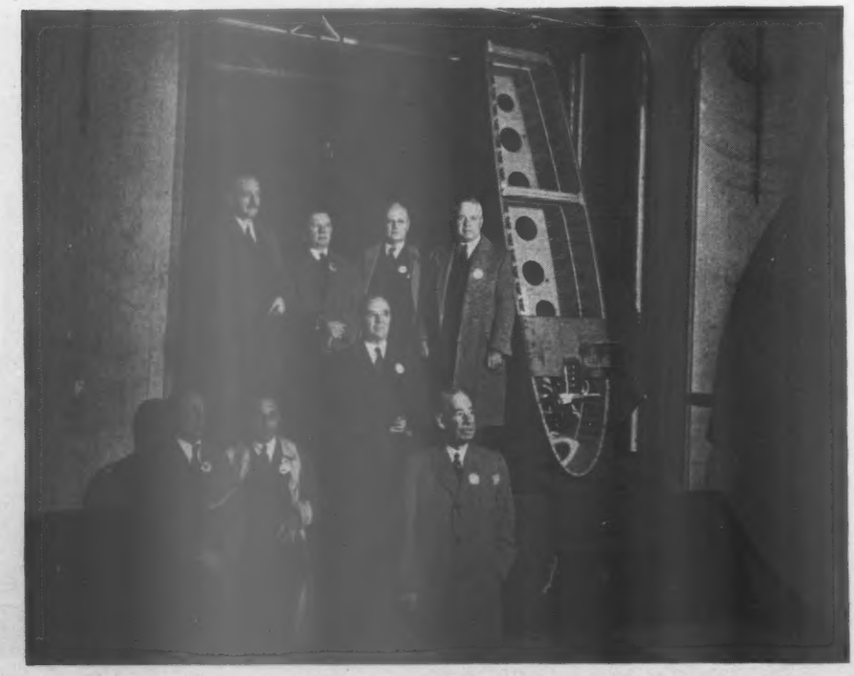
Like previous bulletins, it suggests that, in classifying registrants employed in these activities, local boards should give consideration to the training, qualification, or skill required for the occupation; the training, qualification, or skill of the registrant; and the availability of persons with qualifications or skill, or who can be trained to replace the registrant, and the time in which such replacement can be made.

Supplementary List of Snubber Applications

RECENT circular letters to members of the A. A. R. Mechanical division, and to tank car owners about the application of spring snubbers to tank car trucks have now been supplemented by revised and amplified lists of (A) Private car owners who have agreed to permit railroads to apply snubbers to truck spring clusters of their cars; and (B) private car owners who advise with respect to application of truck spring clusters on their cars that (1) all of their cars are already equipped, or (2) the necessary snubbers have been purchased and will be applied by their own forces, or (3) arrangements have been made with one or more railroads over which their equipment moves to apply these devices to their cars.

The list of private tank car owners who have agreed to permit the railroads to apply snubbers to truck spring clusters of their cars includes 47 car owners with an ownership of 55,121 cars. Those with cars already equipped, necessary snubbers purchased and being applied by their own forces, or arrangements made for application by one or more railroads over which their equipment moves include 43 car owners with an ownership of 50,586 cars.

* * *



Directors of the Pullman-Standard Car Manufacturing Company watch the loading of aircraft wings into a box car for shipment—Left to right, Bottom row: H. M. Dudley, Wallace N. Barker, C. W. Seabury, R. L. Gordon. Top row: Ralph S. Euler, C. A. Liddle, president; C. W. Wright, and Huntley H. Gilbert

New WPB Committee to Evaluate Labor Requirements

A LABOR Requirements Committee has been organized by the War Production Board to aid in co-ordinating that agency's activities with those of the War Manpower Commission, WPB Chairman Donald M. Nelson has announced. The chairman of the new committee is Ferdinand Eberstadt, WPB vice-chairman in charge of program determination, and its vice chairman is Carl J. Goff, assistant president of the Brotherhood of Locomotive Firemen & Enginemen. Altogether ten government agencies are represented on the committee including O.D.T., represented by Edwin M. Fitch, assistant director, Division of Transport Personnel.

The functions of the new committee, the announcement indicates, are to keep the War Manpower Commission informed on the scope of the war supply program and its effect on labor requirements, to make recommendations as to the relative importance of industries as a basis for the establishment of labor priorities, and to consider from the standpoint of manpower facilities the feasibility of programs submitted to the office of program determination. When essential labor requirements cannot be met in any area, the announcement adds, a system of labor priorities will be administered by WPB through local labor requirements committees.

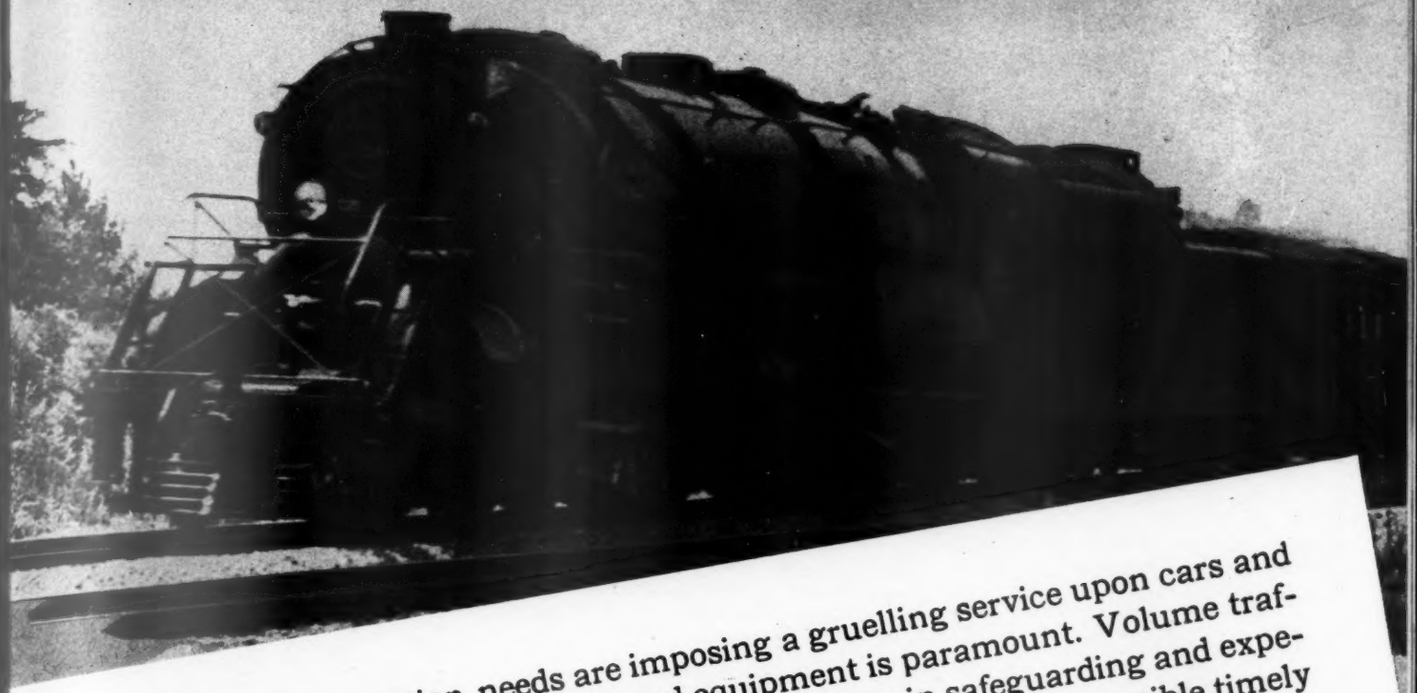
Union-Management Conference on Permanent Basis under ODT

A PERMANENT joint railway labor-management conference was organized under Office of Defense Transportation auspices on October 29, Director Eastman has announced. It will meet on the last Thursday preceding the last Friday of each month, unless Mr. Eastman calls a special meeting at another time.

Members of the railroad executives' committee, designated by the Association of American Railroads, are: M. W. Clement, president of the Pennsylvania; E. W. Scheer, president of the Reading; J. B. Hill, president of the Louisville & Nashville; E. E. Norris, president of the Southern; H. W. Baldwin, chief executive officer of the Missouri Pacific; and C. E.

(Continued on next left-hand page)

"Four-Way" *Brake Maintenance* Helps Sustain *Availability* of Equipment



WARTIME transportation needs are imposing a gruelling service upon cars and locomotives. Availability of all railroad equipment is paramount. Volume traffic must move swiftly, surely . . . The function of air brakes in safeguarding and expediting vital freight is even more important today than ever before. As possible timely aids toward keeping them in good condition, the following reminders are offered.

1 An out-of-order valve should not be taken apart while it is on a locomotive or car. Remove the complete device, or portion, and replace with one known to be in good condition, keeping exposed internal surfaces protected from dirt and injury. All inspection, cleaning, and oiling should be done at a shop bench.

2 If minor replacements are necessary, it is sound practice to use "genuine" repair parts, which insure a first class maintenance job without extra machining or fitting. Time and labor are thus minimized, reliable service prolonged.

3 When a valve needs major repairs, let us do this work for you. We have adequate and proper facilities — skilled mechanics, improved methods, accurate machines and tools. Exacting standards in materials and workmanship are thus maintained, correct performance of reconditioned apparatus guaranteed.

4 Consult our field men freely concerning your problems of air brake operation and maintenance. They are eager to help you get the best service from your existing equipment on hard-working cars and locomotives.

WESTINGHOUSE AIR BRAKE CO.

WILMERDING - - PENNSYLVANIA

Denney, president of the Northern Pacific. The committee representing the railway labor organizations consists of the following: D. B. Robertson, president, Brotherhood of Locomotive Firemen and Enginemen; George M. Harrison, grand president, Brotherhood of Railway Clerks; S. J. Hogan, president, National Marine Engineers' Beneficial Association; B. M. Jewell, president, Railway Employees Department, American Federation of Labor; and A. F. Whitney, president, Brotherhood of Railroad Trainmen.

In addition to the six railroad executives and six labor representatives, it will include Otto S. Beyer and V. V. Boatner of the ODT, and Mr. Eastman will serve as chairman. The problem of railroad manpower and training was the first major topic considered by the conference at its first meeting held in November.

Supply Trade Notes

HARRY CRUMP has been appointed assistant to K. R. Beardslee, sales manager of the Carboloy Company, Inc., Detroit, Mich. Mr. Crump was formerly development engineer on carbide-tool applications and development at the central works laboratory of the General Electric Company at Schenectady, N. Y.

◆

HARRY W. RENICK has been appointed a vice-president of the Brake Shoe and Castings division of the American Brake Shoe & Foundry Co. Mr. Renick, who is also vice-president of Brake Shoe's Ramapo Ajax division, was born in Denver, Colo. He majored in civil engineering at Stanford University and after college was em-

Harry W. Renick

ployed with the Union Pacific and the Colorado & Southern in engineering and construction work. In 1913 he joined the Elliot Frog & Switch Co., now a part of Ramapo Ajax, and three years later was sent to St. Louis, Mo., as sales manager. In 1926, Mr. Renick was instrumental in opening Ramapo's first plant on the west coast at Los Angeles, Cal., for the manufacture of railroad frogs, switches, and special trackwork. He was placed in charge of this plant and also, some time later, of a new plant at Seattle, Wash. When Ramapo Ajax became a Brake Shoe division, he was appointed vice-president in charge of the division's western plants at Los Angeles, Seattle and Pueblo, Ariz.

◆

THOMAS C. WILSON, INC.—O. J. Bagnoli, vice-president and general manager of Thomas C. Wilson, Inc., manufacturers of tube cleaners and tube-cleaning accessories, announces the removal of the company's offices and plant to a new three-story reinforced concrete building at 21-11 Forty-Fourth avenue, Long Island City, N. Y. By this move floor space has been increased nearly four times and, should the need arise, additional stories can be added.

◆

W. E. GRIFFITHS, manager of the product development department of the Allegheny Ludlum Steel Corporation, has been appointed assistant manager of sales of flat rolled products.

◆

THE B. F. STURTEVANT COMPANY, Hyde Park, Boston, Mass., has opened a new branch plant at LaSalle, Ill., to serve as the company's mid-west production center, superseding the factory at Sturtevant, Wis., which was recently closed.

Obituary

JAMES B. STRONG, formerly president of the Ramapo Ajax Corporation (now the Ramapo Ajax division of the American Brake Shoe & Foundry Co.), died at Setauket, Long Island, N. Y., on November 10. He was 66 years of age.

◆

ALBERT E. CRONE, vice-president and general manager of the Buffalo Brake Beam Company at Lackawanna, N. Y., since 1922, died suddenly at his home in Buffalo, N. Y., on October 18, 1942. Mr. Crone was born in Newmarket, Ont., on February 27, 1872. He entered the service of the New York Central in 1892 and resigned in 1912 as storekeeper at Depew, N. Y., to enter the service of the Buffalo Brake Beam Company where he had since been employed as storekeeper, plant superintendent, and vice-president and general manager. He was a member of the Central Railroad Club of Buffalo.

◆

GEORGE M. VERITY, chairman of the American Rolling Mill Company, Middletown, Ohio, died in that city on November 6. Mr. Verity was born in East Liberty, Ohio, on April 22, 1865. In 1886 he became manager of the W. C. Standish Wholesale Grocery Company in Cincinnati, Ohio, and in 1889 entered the steel in-

George M. Verity

dustry, taking over the management of the Sagendorf Iron Roofing and Corrugating Company in Cincinnati. In 1891 the company was reorganized as the American Steel Roofing Company and Mr. Verity was elected vice-president and general manager. While serving in these capacities Mr. Verity decided to organize a company to manufacture iron and steel sheets, and in 1899 the American Rolling Mill Company, Middletown, Ohio, was incorporated. At the first meeting of the board of directors on January 5, 1900, he was elected president and general manager. He continued as president until January 8, 1930, when he was elected chairman of the board.

◆

EDMUND N. BOSWELL, manager of the Dunkirk, N. Y., plant of the American Locomotive Company since 1937, and an employee of that company for more than 44 years, died November 19. He was 60 years of age. Mr. Boswell joined the American Locomotive Company in 1898 as a machinist at the Richmond, Va., plant, which was then known as the Richmond Locomotive Works. During the World War, he served the company at Paterson, N. J. When the Paterson plant was closed in 1926, he was transferred to the New York offices. In January, 1937, he went to Montreal, Canada, as manager, and on December 1 of that year was transferred to Dunkirk.

Army-Navy "E" Awards

American Forge Division of the American Brake Shoe & Foundry Company. October 24.

American Welding Company, subsidiary American Car and Foundry Company, Carbondale, Pa. November 10.

Armstrong Cork Company, Lancaster, Pa. Floor division and Closure plants. November 30.

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PASSENGER POWER
AMERICAN LOCOMOTIVE COMPANY

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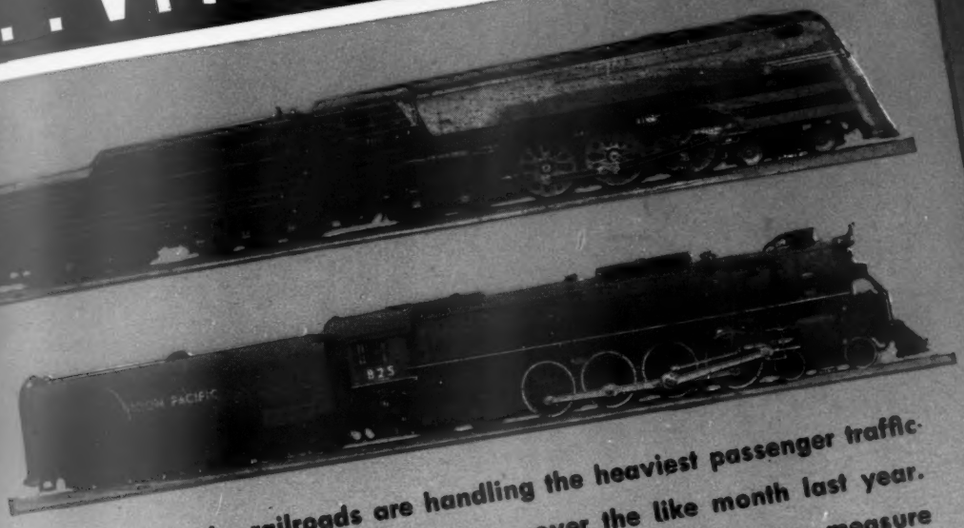
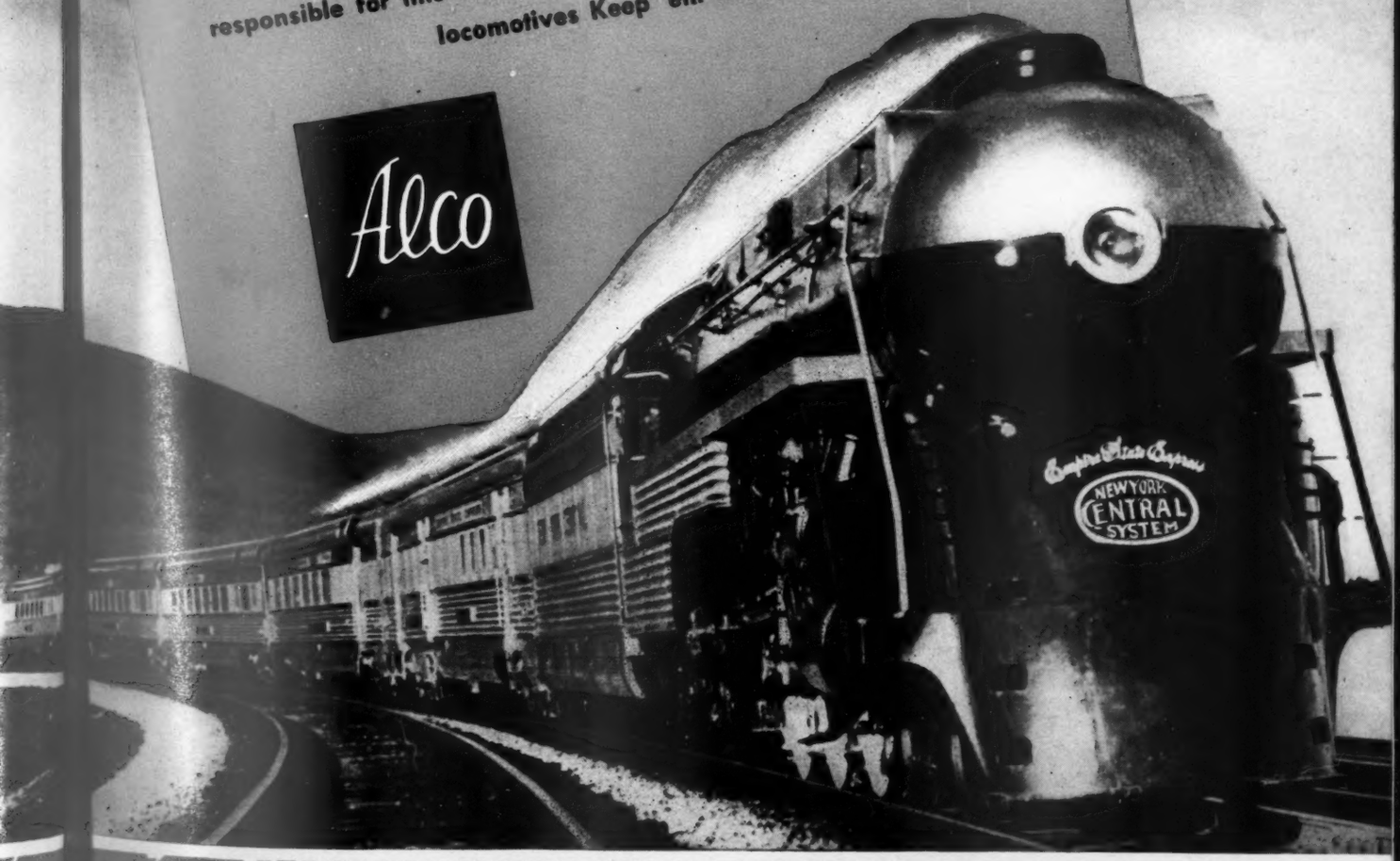
with Speed and Dependability
. . . VITAL TO THE WAR EFFORT



Right now the railroads are handling the heaviest passenger traffic on record—up 65 per cent in June over the like month last year. Powerful steam locomotives of proven design are in large measure responsible for this excellent showing. Dependable modern steam locomotives Keep 'em Rolling.

Alco



Y 30 CHURCH STREET NEW YORK N.Y.

POWERFUL LOCOMOTIVES

FOR FAST FREIGHT SERVICE

Not only railway passenger, but freight service too, is making history in aiding the war effort. And here again modern steam locomotives of proven design Keep 'em Rolling.

AMERICAN LOCOMOTIVE COMPANY
30 CHURCH STREET · NEW YORK · N.Y.

Personal Mention

General

D. V. GONDER, locomotive foreman of the Canadian National at Turcot, Que., has been appointed superintendent of motive-power and car shops at Montreal, Que.

W. Q. DAUGHERTY, master mechanic of the Gulf, Mobile & Ohio at Jackson, Tenn., has been appointed assistant superintendent of motive power and car equipment, with headquarters at Jackson.

E. S. MCCRACKEN, superintendent of the Canadian Pacific at Medicine Hat, Alta., has been promoted to general superintendent of the Algoma district, with headquarters at North Bay, Ont. Mr. McCracken entered the service of the C. P. R. in 1910 as a fireman at Medicine Hat, Alta. Previous to that time, he was a machinist on the Intercolonial Railway in New Brunswick. In 1917 he became an engineer at Medicine Hat and two years later road foreman of engines. In 1921 he was transferred to Lethbridge, Alta., as master mechanic, and in 1926 he became assistant superintendent at Calgary. He was transferred to Lethbridge in 1929 and in 1934 he was appointed superintendent at North Bend, B. C. In 1936 Mr. McCracken was transferred as superintendent to Nelson, B. C. and later served successively as superintendent at Revelstoke, B. C., and Medicine Hat.

E. S. McCracken

Master Mechanics and Road Foremen

R. R. SNEDDON, assistant master mechanic of the New York Central (Michigan Central) at West Detroit, Mich., has been appointed master mechanic, with headquarters at Jackson, Mich.

H. E. ANDERSON, assistant division master mechanic of the Atchison, Topeka & Santa Fe at La Junta, Colo., has been appointed to the newly created position of master mechanic of the Western division, with headquarters at Dodge City, Kan.

JAMES J. RYAN, general foreman of the Chicago, Rock Island & Pacific at Armourdale (Kansas City), Kan., has been appointed to master mechanic of the Arkansas division, with headquarters at Little Rock, Ark.

W. G. RINGLAND, assistant master mechanic of the New York Central, has been appointed master mechanic, in charge of the motive power and car department, Pennsylvania division, with headquarters as before at Avis, Pa. The positions of division general car foreman and assistant master mechanic at Avis have been abolished.

Car Department

A. P. GILSDORF, car foreman of the Norfolk & Western at Lambert Point, Va., has been promoted to the position of general car inspector, at Roanoke, Va.

WALTER C. KRESGE, a special apprentice in the employ of the Lehigh Valley at Sayre, Pa., has been promoted to the position of general car foreman at Sayre.

Shop and Enginehouse

F. A. BALDINGER, district master mechanic of the Baltimore & Ohio at Baltimore, Md., has been appointed general supervisor of locomotive maintenance with the same headquarters.

A. H. ADANG, who has been appointed superintendent of shops of the New York, Chicago & St. Louis at Conneaut, Ohio, as announced in the September issue, was born on September 23, 1901, at Portland, Jay County, Ind. He is a graduate of a country school in Portland (1915). In October 9, 1916, he entered railway service as a machinist apprentice in the employ of the Pennsylvania at Ft. Wayne, Ind., and was a machinist on that road from 1920 to 1924. On October 13, 1924, he became a machinist on the New York, Chicago & St. Louis and in June, 1936, was promoted to the position of assistant enginehouse foreman. He became general foreman of the locomotive shops at Conneaut in February, 1942, and on June 16, 1942, was appointed superintendent of shops.

A. H. Adang

Obituary

F. N. HAYES, master mechanic of the Virginian at Elmore, W. Va., died on November 13, at Mullens, W. Va.

TIMOTHY B. ROBERTS, supervisor of apprentices of the Lehigh Valley, died after a short illness on October 14, 1942, at the age of 56 years. Mr. Roberts was born in Wellsboro, Pa. Mr. Roberts entered the service of the Lehigh Valley as a call boy at the age of 14. He became a machinist apprentice at Sayre in 1905, and after his apprenticeship was employed in the Sayre shops as a machinist for 11 years. In June, 1918, he became a foreman and in August, 1924, a piecework inspector, continuing as such until February, 1930, when he became supervisor of apprentices.

EDWIN W. NORRIS, master mechanic of the Frankfort & Cincinnati, with headquarters at Frankfort, Ky., died of a heart ailment at a hospital in that city on October 25.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

VALVE REPAIRS.—Crane Co., 836 South Michigan avenue, Chicago. Bulletin No. 5, "How to Repair Valves," explains and illustrates various steps in repairing leaky gate and globe valves. Hints on how to reclaim discarded valves.

◆

UNIVERSAL SLOTMASTER.—Experimental Tool & Die Co., 12605 Greiner avenue, Detroit, Mich. Four-page illustrated bulletin describes the Universal Slotmaster and six different set-ups on the machine.

◆

"OILING THE LATHE."—South Bend Lathe Works, South Bend, Ind. Nineteen-page illustrated Bulletin H-2, the second of a series on lathe service, emphasizes the importance of proper lathe lubrication in maintaining maximum performance and accuracy and outlines a regular procedure of oiling with proper lubricants at definite intervals.

◆

"STELLITE" TOOLS.—Haynes Stellite Company, Unit of Union Carbide and Carbon Corporation, 30 East Forty-second street, New York. Form 5783—"Stellite 98M2 Metal-Cutting Tools for Machining Steel"—lists the sizes and prices of 84 standard square and rectangular tool bits and 74 varieties of welded-tip tools, all made of 98M2, a non-ferrous cutting-tool material. Recommendations regarding grinding wheels for use on tools of this alloy also presented for several types of hand- and machine-grinding operations.

INDEX TO ADVERTISERS
DECEMBER, 1942

HIGH-IRON THROUGH IRAN

On a desert in Southern Iran (formerly Persia) so hot that 100 degrees is considered temperate, railroad men from Altoona, Chicago, St. Louis, and Schenectady are hustling around new workshops where American-made locomotives and rolling stock are being shaped up for service on the Trans-Iranian Railway.

Rubbing shoulders with these grimy Yankees are bearded Sikhs, blond Russians, British railroaders from Crewe and Swindon, dark-skinned Armenian and Persian mechanics and drivers. They mingle and mill in a Hollywood boom town half way around the world from our picture capital. Their business is to move desperately needed defense material through Iran into Russia.

The Russian railroad from Arctic Murmansk is one of the life lines for Northern Russia. But the Trans-Iranian Railway has become the more important life line for Southern Russia. Hence, American railroaders, after doing magnificent jobs in their own country, have been sent to Iran. They are working alongside British railroaders, helping to keep the line open and active.

After the Shah of Persia had spent $160,000,000 of his subjects' money on his Trans-Iranian—in 1938—he proudly boasted that it ran "from nowhere to nowhere" across his desolate but oil-bearing country from the Persian Gulf almost to the inland Caspian Sea. As he wanted no help from Soviet Russia or Britain, his north-and-south railway was built to block Russian or British economic penetration.

When British and Russians deposed the Persian tyrant—in 1940—the Trans-Iranian had only two locomotives, rails that were falling apart, and almost no sidings for two-way traffic on 960 miles of "isolationist" tracks. A small group of British engineers began putting this rickety railroad into operating condition. Gradually hundreds of American railroaders joined them.

They laid 75 miles of new steel across tough plateaus and deserts and through gorges connecting the "nowhere to nowhere" Trans-Iranian with a Caspian port of embarkation for Southeastern Russia. They have also extended the Shah's original line across the Baluchistan border, heading toward India.

Since the Allies officially occupied Iran—last year—United States and British engineers have turned blueprints into vast jetties, sheds, and workshops. They have installed modern equipment, have put thousands of experienced maintenance and operating railroaders in charge of the right of way. American locomotives are sharing the high-iron of Iran with their British cousins, hauling three times the volume of defense supplies to Russia that Iran's railroads carried a year ago.

American railroaders are getting set to do similar jobs—building and operating—on the new line to Alaska and new lines to other places. Some of these fighting-front fellows did their transportation bits in Europe during the first World War. During this World War they are going farther and doing the job better.

In Iran they are battling night and day in the cause of beleaguered Russia. They may have to build a long rail line around the eastern shore of the Caspian to get the vital supplies through. But if anyone can do it, those American railroaders can.

—The Trackwalker

AMERICAN LOCOMOTIVE • GENERAL ELECTRIC

114-22-9660

Prelude to PEACE

In the Prelude to the Peace for which we strive, the dominant note is the rhythmic hum of coordinated production. Day by day the pitch becomes higher, the beat faster, the sound louder and more inescapable. • In our own plants this sound is unmistakable. There's the vibrant feel of smoothly functioning production in the air. There's the look of it in the eyes of the men. Coordination has everywhere replaced confusion. Confidence has everywhere replaced uncertainty. There's Victory in the air. And Victory is the Prelude to Peace.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

INFORMATION IS *Ammunition* FOR THE TROOPS ON THE PRODUCTION LINES

HANDBOOK OF SPECIAL STEELS

Newly revised and reprinted—a comprehensive book on the properties, uses and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference and selection. 124 pages, pocket-sized.

★

ELEMENTARY DISCUSSION ON TOOL STEELS

An informative booklet that gives clear and detailed data on the various types of Tool Steels, their properties and handling. Excellent for training courses in metals and metal working.

IN more than one sense, and all of them very real, information is ammunition in these days of metal-working pressure.

Complete information on Tool Steels in the hands of production executives leads to the conservation of these highly strategic steels; to the selection of types better suited to individual jobs; and in many cases, to vast improvements in performance. (*A diesel engine builder, for example, found that DBL High Speed Steel reamers averaged 800 pieces per grind against a previous maximum of 200 pieces with 18-4-1.*)

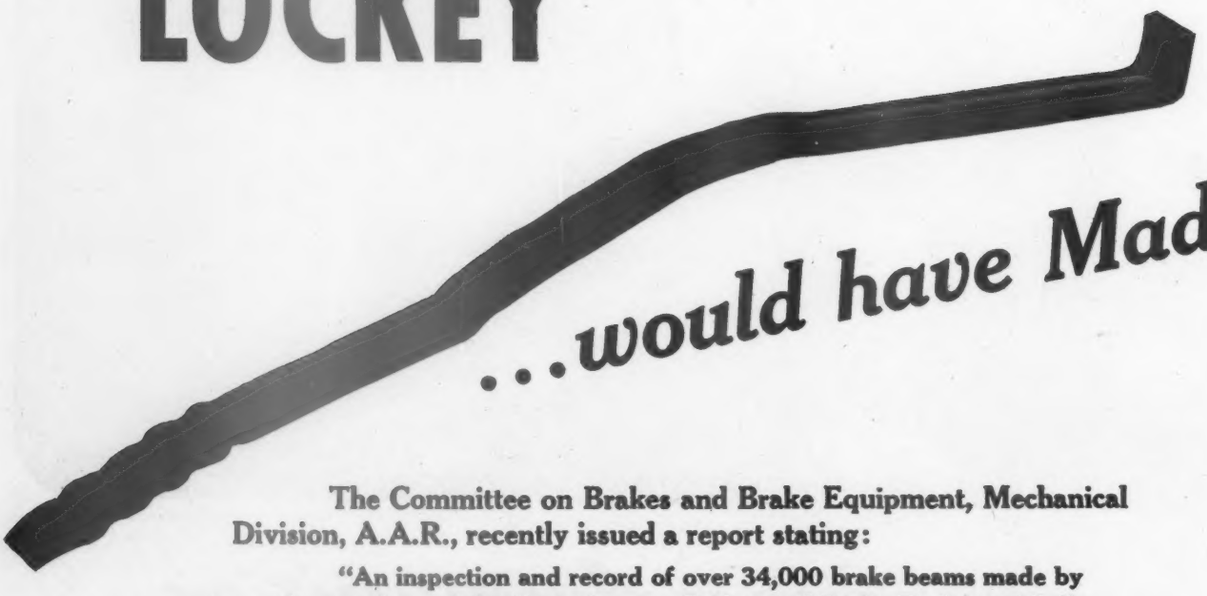
The Allegheny Ludlum "Handbook of Special Steels" is a bible of data for production men, and our "Elementary Discussion on Tool Steels" is invaluable for use in apprentice and training courses.

● *Write for the copies you need.*

Address Dept. T-246

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

A Brake Shoe LOCKEY



...would have Made

The Committee on Brakes and Brake Equipment, Mechanical Division, A.A.R., recently issued a report stating:

> "An inspection and record of over 34,000 brake beams made by the members of the Committee on Brakes and Brake Equipment indicated that approximately 50% of all brake beam removals are due to worn heads. The worn head condition is a direct result of relative motion between the brake shoe and brake head. The better the brake shoe fits the head, the less this relative movement will be and consequently will minimize the wear."

Motion between the brake head and brake shoe in freight car operation is minimized by the Brake Shoe Lockey. It holds the shoe and head tightly together. It also prevents loss of shoes and keys while on car dumpers or by chattering brakes.

The Lockey, made of alloy spring steel, specially heat treated, will not take a permanent set and can be used many times.

Use the Brake Shoe Lockey in all your freight equipment and reduce brake beam removals to a minimum.

THE AMERICAN BRAKE SHOE

Rich—Distinctive—Yet Practicable

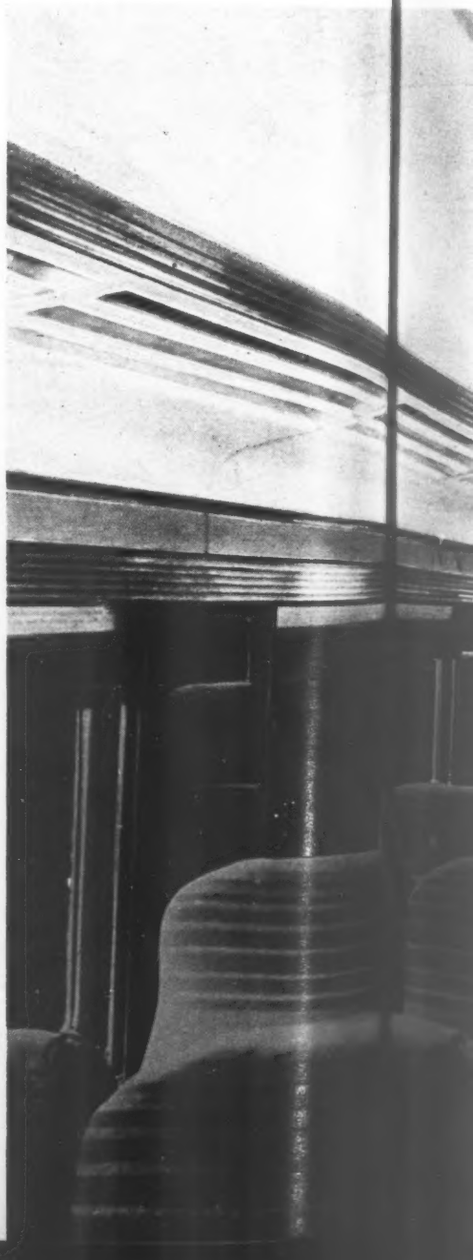
PRESSED STEEL CAR has again demonstrated its initiative and creative powers when the company developed and built the 25 new deluxe streamlined coaches for the New York Central . . . These cars are an outstanding example of modern construction. The interior combines an unusual degree of luxurious refinements, skilled workmanship, harmonious architecture and color treatment, and interior appointments and conveniences, all adapted to meet the most exacting passenger requirements. Special features include unique mouldings, continuous lighting fixtures, mirrors at all pier panels, solid basket racks with louvers for clear view, gun metal mirrors with full size map of New York Central System at the partition of lounge rooms and glass partitions at the passageway.

PRESSED STEEL CAR designed these cars not merely for public appeal and comfortable easy riding — but special emphasis was placed on safety and resistance to collision. The car body, including all outside sheets, is primarily of Cor-Ten steel. The side frame is of the girder type riveted construction. The ends of cars are equipped with a cast steel platform and center sill casting, welded to the center sills. The welded underframe, embodying the bolsters, crossbearers, and center sills, was specially engineered by PRESSED STEEL CAR for great strength.

The interior decoration and color schemes were developed in collaboration with Lurelle Guild, Industrial Designer, of New York, N. Y.

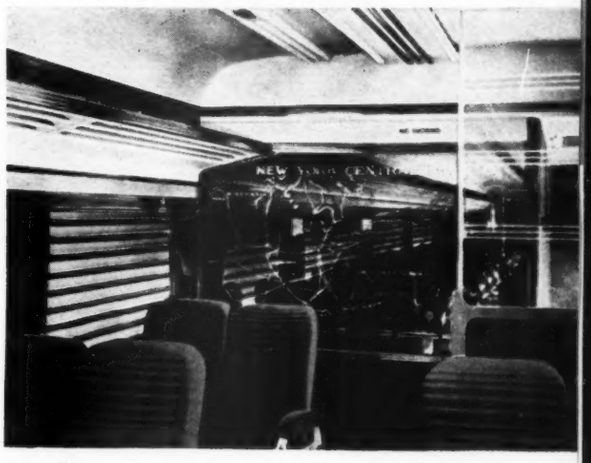
THESE CARS ARE ANOTHER PRESSED STEEL CAR ACHIEVEMENT

PRESSED STEEL
CAR COMPANY, INC.
PITTSBURGH, PA.



NEW YORK CENTRAL

selects
Pressed Steel Cars
for their Pacemaker
and other important
trains



A distinguished award

HUNTER

AN AMERICAN GENTLEMAN'S WHISKEY SINCE 1868

CANADA DRY WATER

Earned by Every Employee

of Chicago's Only Tank Arsenal

Army-Navy Production Award Conferred on Men and Women of the Hegewisch Plant, Pressed Steel Car Co., Inc.—Now Building a Solid Trainload of M-4 Tanks Every Day

★ ★ ★

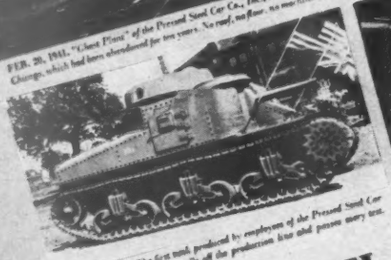
"Wear this 'E' emblem with pride. You've earned it!" That's what Uncle Sam tells each of the hard-hitting, patriotic employees of Hegewisch Plant, Pressed Steel Car Company, Inc.

Starting from scratch 20 months ago, Chicago's only tank arsenal to date has met every production task set for it by the Army Ordnance department in the production of M-4 medium American tanks. Its future tank output, to be reached soon, will be twelve times the original quota! Results like these are possible only through TEAMWORK—the loyalty and unstinted service of every worker. Theirs is the honor for a great job that is helping to keep America great.

—and These Pictures Show WHY!

FEB. 20, 1941. "Ghost Plant" of the Pressed Steel Car Co., Inc., at Hegewisch, Chicago, which had been abandoned for two years. No roof, no floor, no machinery.

APRIL 9, 1941. Plant completely re-roofed, new cement floor laid, beginning of machine tools being installed—as Chicago's only tank arsenal.



JULY 15, 1941. The first tank produced by employees of the Pressed Steel Car Co., Inc., Hegewisch Plant rolls off the production line after passing many tests.

TODAY at Chicago's only tank arsenal—only plant in Illinois delivering tanks—the employees of Pressed Steel Car Co., Inc., build a trainload of tanks every day!

PRESSED STEEL CAR COMPANY, Inc.

HEGEWISCH PLANT — ARMY E NAVY — **ARMORED TANK DIV.**

PRESSED STEEL CAR COMPANY, INCORPORATE

Waste Warden Tells HOW TO GET LONGER SERVICE

from your Welding and Cutting Apparatus

TORCHES

1. Blow out hose before attaching torch.
2. Be sure the torch seat is clean.
3. Be sure packing nut is tight.
4. Also—don't use torch as a hammer. A torch built to withstand such abuse would be too heavy to handle.

TIPS

1. Clean tips with proper size standard cleaning drills only. Be sure to use a drill one size smaller than the orifice about to be cleaned. Makeshift wire cleaners enlarge tip openings and upset flame balance.
2. Store all tips in racks to prevent damage. Tips battered at seating end waste gas.

REGULATORS

1. Keep regulator seat dust free. Before attaching regulator clean outlet by cracking cylinder; clean gland by a short blast from cylinder.
2. Release regulator adjusting screw when changing cylinders. This prevents high pressure shocks to regulator seat.
3. Always open cylinder valve slowly when installing regulator. Repeated sudden cracking of cylinder into regulator promotes leakage.

DON'T JUNK DAMAGED APPARATUS

Today regulators, torches and tips are hard to replace. Good maintenance practices will help you get longer service and better performance from your gas welding and cutting apparatus.

If a torch, tip or regulator is damaged, don't junk it—have it repaired promptly.

AIR REDUCTION

60 EAST 42nd STREET, NEW YORK, N. Y.

IN TEXAS: MAGNOLIA-AIRCO GAS PRODUCTS COMPANY

AIRCO

WILSON

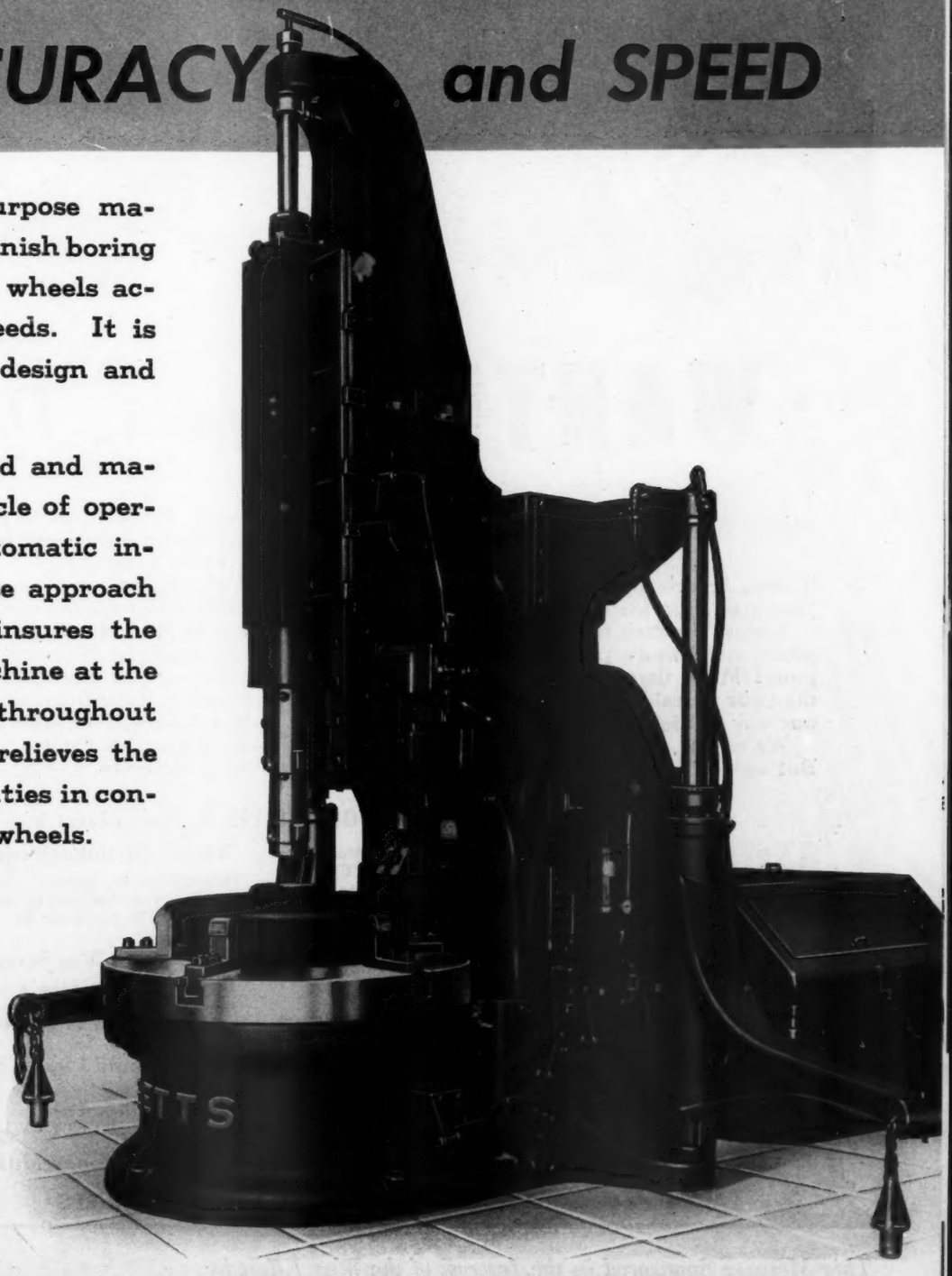
OXYGEN IS PRODUCTION — *Don't Waste it!*

THE NEW BETTS HYDRAULIC FEED CAR WHEEL BORER

for ACCURACY and SPEED

Here is a special purpose machine for rough and finish boring and chamfering car wheels accurately at high speeds. It is simple and rigid in design and easy to operate.

After wheel is loaded and machine started, the cycle of operation is entirely automatic including rapid traverse approach and return. This insures the operation of the machine at the greatest efficiency throughout its entire cycle and relieves the operator for other duties in connection with boring wheels.



Other Consolidated Machine Tools for Railways include The Betts-Bridgeford Axle Lathe and the Betts-Bridgeford Journal Truing Lathe.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

★ WANTED *Fighting Dollars* ★

Make Every Pay Day . . . BOND DAY

Today, Americans are dying so that America, your *free America*, can live!

Today, the men in our Army and Navy urgently need *more* planes, *more* tanks, *more* guns! More than our enemies have, better than our enemies have, if we're going to smash our way to Victory!

We've got to get them. We will get them. But only if every man, woman, and child in America *helps!* And helps voluntarily, regularly, in the American Way—the War Bond way—every pay day.

Every dollar you can lend *your* Government is needed and needed now! Start getting your share of War Bonds and Stamps today. Get them *regularly*. Plan to set aside money every pay day—every single dime that you can. And remember, your Government guarantees that your money will come back to you *with interest*—as much as $4 for every $3 when Bonds are held to maturity.

YOU GET A $25 U. S. BOND FOR ONLY $18.75 ★ ***Facts about War Bonds (Series E)*** ★

How much do they cost? You LEND Uncle Sam	*Upon Maturity* You GET BACK
$18.75	$25.00
$37.50	$50.00
$75.00	$100.00
$375.00	$500.00
$750.00	$1,000.00

When is maturity?

Ten years from the time you buy the Bond. If you need the money before then, you can cash the Bonds at any time after 60 days from issue date. A table of cash-in values is printed on each Bond. Naturally, the longer you hold the Bond, up to 10 years, the more money you'll get back. But you'll never get less than you put in.

What's the interest rate?

When held to maturity, the Bonds yield 2.9% per year on your investment, compounded semiannually—you get $4 for every $3.

What about War Stamps?

Buying War Stamps is a convenient way of saving money with which to buy a War Bond. Stamps are sold for as little as 10 cents.

When should I buy a Bond?

Start now; buy regularly. If your company has a Pay-roll Savings Plan, take advantage of it, NOW. INVEST IN SAFETY—WITH PERFECT SAFETY!

America Needs Men - Materials - Money — *and the Money Must Come from YOU*

Get Your Share of U. S. WAR BONDS ★ STAMPS

This Message Sponsored in the Interest of the War Effort by

JONES & LAMSON MACHINE COMPANY

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

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J&L

PROFIT PRODUCING MACHINE TOOLS

70-137

ARMY AIR [illegible]
MATERIEL CENTER
OFFICE OF THE DISTRICT SUPERVISOR
CENTRAL PROCUREMENT DISTRICT
8505 W. WARREN AVE.
DETROIT, MICH.

July 13, 1942

PRODUCTION SECTION
CENTRAL PROCUREMENT DISTRICT
MANUFACTURERS' LETTER NO. 10
CHICAGO AREA OFFICE

SUBJECT: Cemented Tungsten Carbide for Cutting Tools

1. The following is quoted from memorandum, dated June 10, 1942, from the War Department, Headquarters. Services of Supply, Washington, D.C.:

"In the interest of conservation of critical alloys and of increased production, attention is directed to the following stated advantages of cemented tungsten carbide tools . . .

"a. One pound of tungsten in the form of cemented tungsten carbide for cutting tools will do the work of 70 to 100 pounds of tungsten in high speed tool steel. Furthermore, its use eliminates substantial amounts of chromium and vanadium which are considered necessary components of practically all high speed tool steel.

"b. Cemented tungsten carbide functions satisfactorily on almost all types of lathes and boring machines, particularly those of the sturdier construction. This is said to include all such machine tools manufactured in the last five years.

"c. Cemented tungsten carbide works efficiently on all steels above approximately .30 carbon and is effective up to 500 brinell or more.

"d. Cemented tungsten carbide will give two or three times the production of high speed tool steel in those operations to which its use is adapted and over a given run will require about one-fifth the number of grinds that standard high speed tool steel will require."

2. This information is forwarded by direction, Wright Field letter, EAZ-ar-72-2, (July 3, 1942).

3. Any requests for further information should be directed to the AAF Chicago Area Office, 20 N. Wacker Drive, Chicago, Illinois, Attention: Production Section.

For the District Supervisor:

HARLEY S. JONES
Lt. Colonel, Army Air Forces
Technical Executive

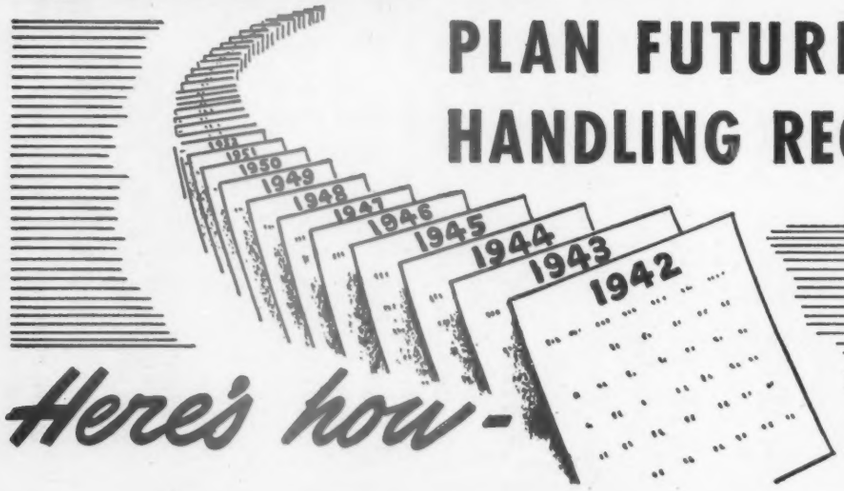
CENTRAL AIR CORPS PROCUREMENT DIST. OFFICIAL WAR DEPT. DETROIT, MICH.

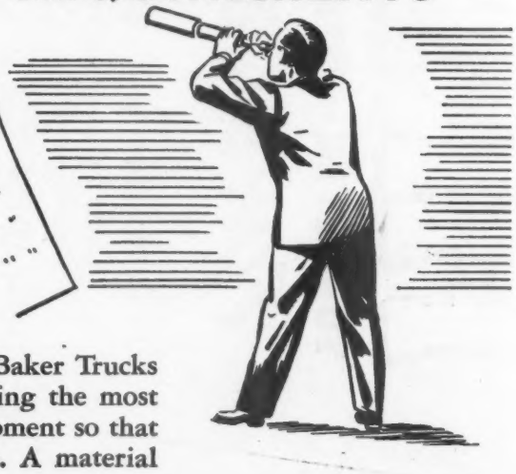
Distribution: 1-D
[illegible] in CPD

NOTE: In the reproduction of the above letter by Firth-Sterling, it is to be understood that it does not imply the WAR DEPARTMENT'S indorsement of any company's products.

BAKER *can help you to*

PLAN FUTURE MATERIAL HANDLING REQUIREMENTS





Here's how -

Even if you cannot furnish priority ratings to purchase Baker Trucks today, we recommend that you make sure you are getting the most out of present facilities, and decide now on needed equipment so that you will be first in line when trucks become available. A material handling survey will answer these questions:

1. ARE PRESENT FACILITIES ADEQUATE?
A study of operations will indicate what new equipment is needed today or in the future.

2. IS PRESENT EQUIPMENT USED TO BEST ADVANTAGE?
Make sure your trucks, cranes and conveyors are in first class running order. See that equipment is used where most needed, and that it has as little idle time as possible.

3. IS EQUIPMENT SUITED TO THE JOB?
Determine changes needed to bring top efficiency. Interchanging some of your own trucks may be advisable, if they are not handling jobs for which intended. Future changes to other types might be indicated.

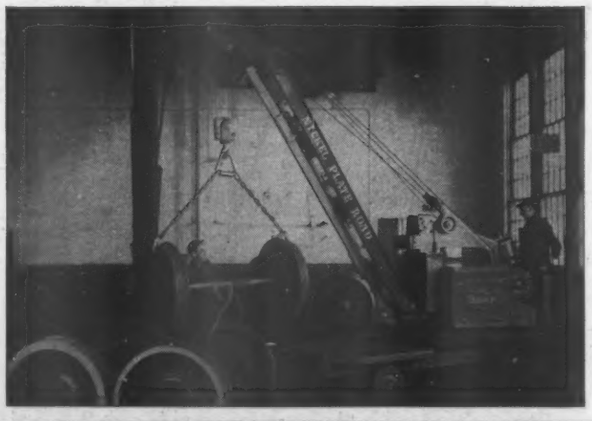
4. IS "UNIT PACKAGE" SYSTEM EMPLOYED?
Efficiency of power trucks is greatly increased by the use of skids, tote boxes and pallets. Are you using them to fullest advantage?

5. ARE SUPPLIERS SHIPPING MATERIALS SO THAT YOU CAN HANDLE THEM EFFICIENTLY?
If not, suggest that they use skids, pallets or package units that can be unloaded efficiently with your power trucks.

THE BAKER MATERIAL HANDLING ENGINEER CAN HELP YOU

He will be glad to go over your entire handling problem with you. His recommendations can save you time and money. He is at your service.

BAKER INDUSTRIAL TRUCK DIVISION
of the Baker Raulang Company
2172 West 25th Street • Cleveland, Ohio



Baker INDUSTRIAL TRUCKS

In Canada: Railway and Power Engineering Corporation, Ltd.

HERE IS *Mileage*!

IN this husky 1¼" rim of the U·S·S One-Wear Wrought Steel Wheel are at least 200,000 miles of fast, safe freight service under normal conditions. Some of these wheels have run 410,962 miles. Many of them have gone well over the 300,000 mile mark before reaching the condemning limit. No other freight car wheel costs so little to run. No other wheel assures comparable safety both to load and rolling stock, is so free from risk of sudden failure, or resists the development of skid flats and brake burns so stubbornly.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

Keep 'em rolling faster and safer with

U·S·S ONE-WEAR WROUGHT STEEL WHEELS

USS

UNITED STATES STEEL

BALDWIN

rugged and dependable

For more than a century, Baldwin's main job has been designing and building motive power equipment for railroads. Baldwin engineers are specialists in meeting railroad problems. Baldwin construction methods have been developed to produce the best in modern power.

This accumulated experience stands back of Baldwin diesel-electric switching locomotives, and the Baldwin-built De La Vergne engines with which they are powered. The electrical equipment is a product of Westinghouse, suppliers of railroad equipment for more than 60 years. The result is a rugged, dependable diesel-electric locomotive giving high availability and speedy car handling in terminals.

Locomotives of all types, military tanks, guns and other essential items—all produced by Baldwin—are playing an important part in America's war program.

Baldwin-built De La Vergne diesel engine and Westinghouse generators as applied to Baldwin 660-hp. diesel-electric locomotives

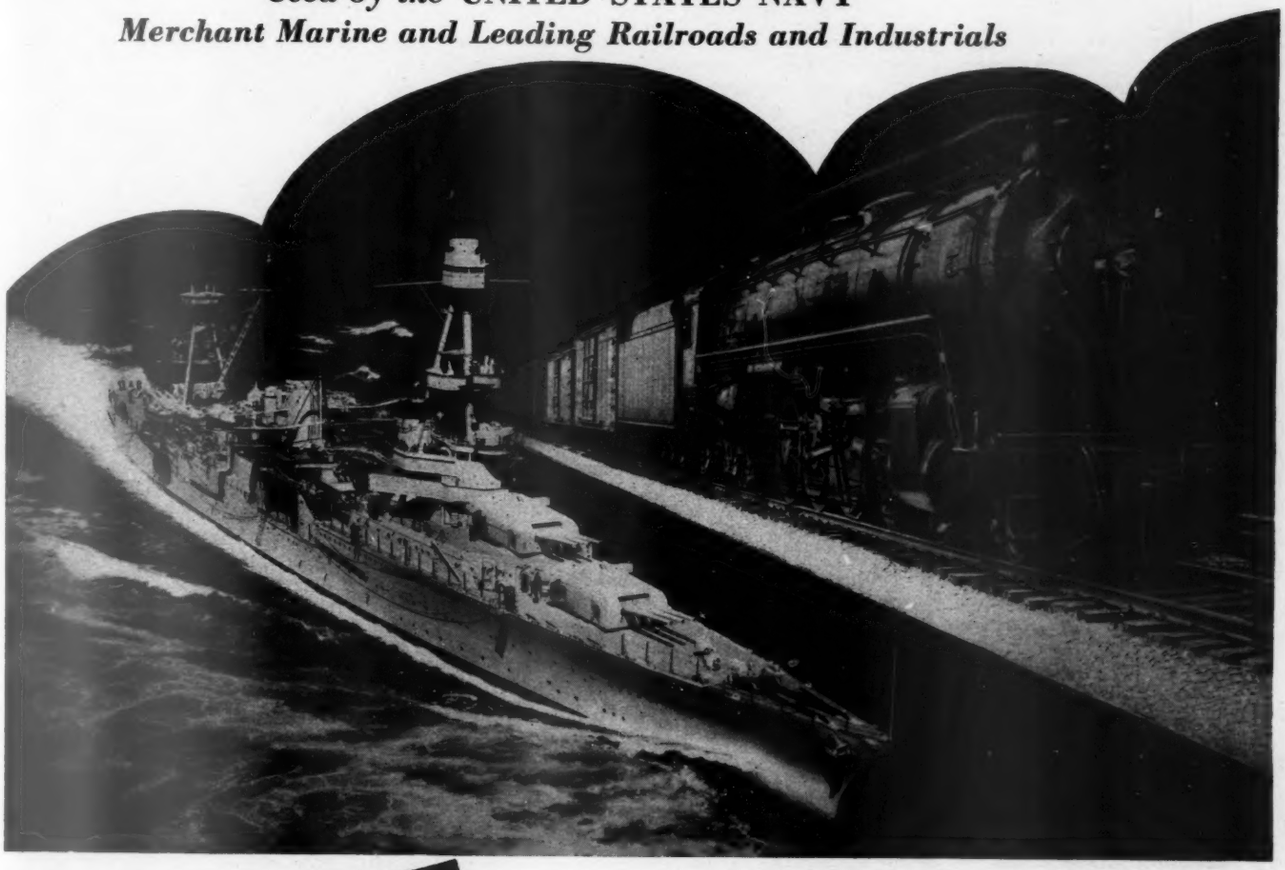
DIESELS

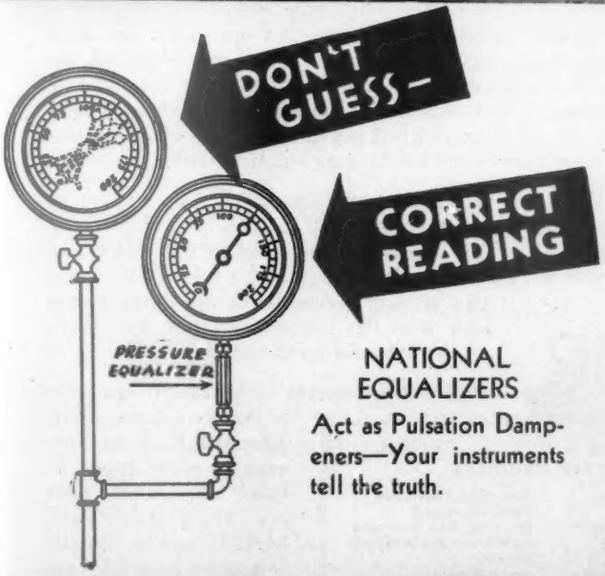
Baldwin 660 hp diesel-electric switcher locomotive for the Chicago and Eastern Illinois DeLaVergne 6-cylinder, 4-cycle diesel engine, Westinghouse electrical transmission equipment

THE
BALDWIN
LOCOMOTIVE WORKS
Philadelphia

NATIONAL GAUGE PRESSURE EQUALIZER

***Used by the* UNITED STATES NAVY**
Merchant Marine and Leading Railroads and Industrials





NATIONAL EQUALIZERS
Act as Pulsation Dampeners—Your instruments tell the truth.

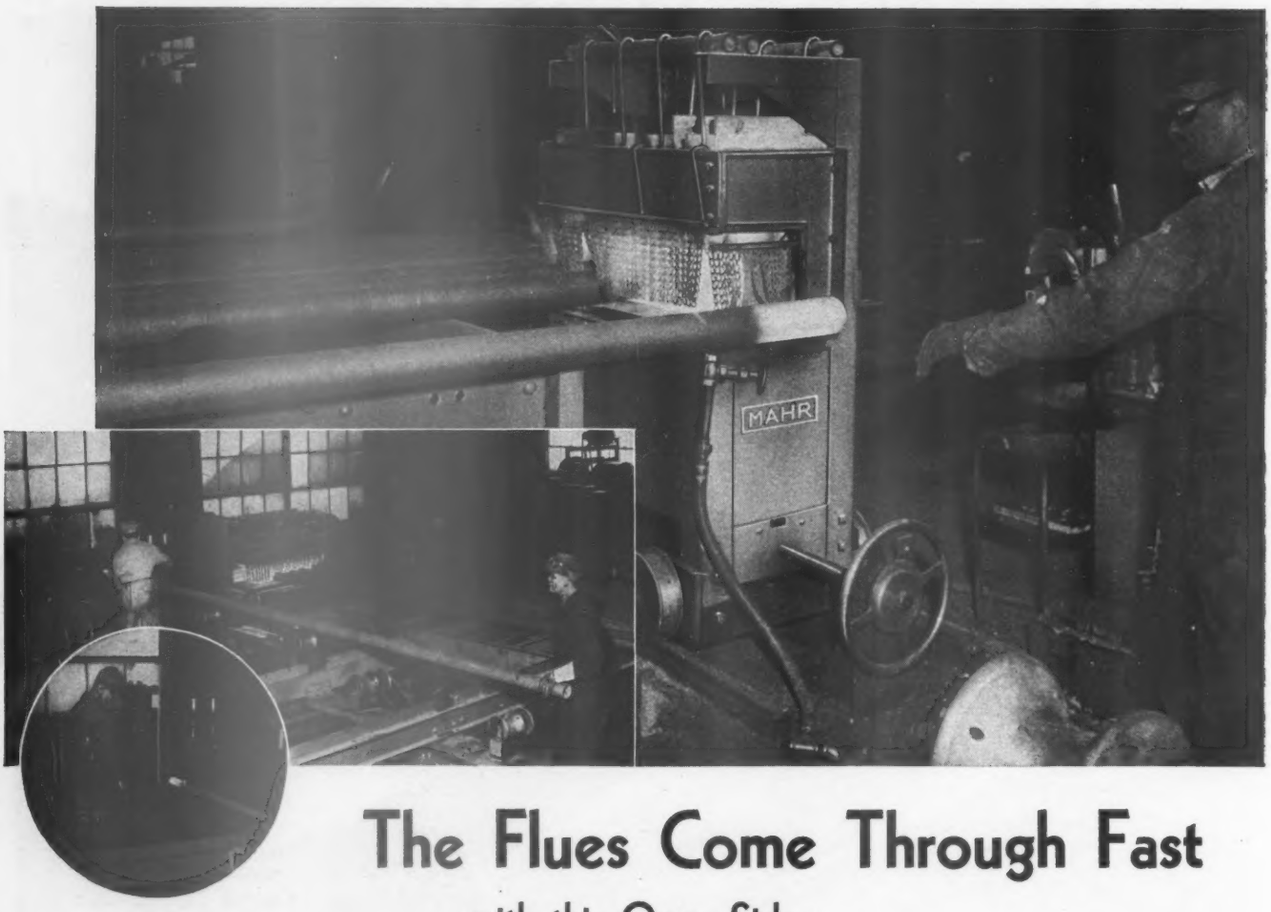
PROTECTS YOUR GAUGES AND RECORDING INSTRUMENTS FROM HAMMER AND DAMAGE CAUSED BY SURGING, PULSATING PRESSURES

CHARACTERISTICS AND ADVANTAGES

1. Increases life of instrument.
2. Two parts its entire construction.
3. Same Equalizer used on 5 lbs. or on 50,000 lbs. pressures.
4. Can be transferred to any service without adjustment.
5. NO VALVE STEMS TO BEND.
6. NO DIAPHRAGMS TO REPLACE.
7. NO WORN OUT RUBBER SACS.
8. WILL NOT CLOG. LAST INDEFINITELY.
9. Its merit recognized by leading instrument and gauge manufacturers.
10. MADE FOR ALL CONDITIONS AND PRESSURES

NATIONAL ENGINEERING PRODUCTS, INC.

Represented in Dominion of Canada by Canadian General Electric Company, Inc.



The Flues Come Through Fast

with this Open Side

MAHR *Special R.R. Type* FURNACE

Here's a splendid example of how the reconditioning of flues can be speeded up, when you have equipment specially designed for the job by heat treating specialists, and engineered to keep a non-stop, progressive, continuous production line.

With a MAHR Open Side Special R.R. Type Furnace, the heated flues are always ready for the swager as fast as he can take them. The flues roll in—are properly heated—and out! The chain curtain permits free rolling and yet maintains a surprisingly efficient closure during the heating period.

This MAHR R.R. Type Flue Furnace is designed to handle flues up to 5⅜" O.D., #8 gauge. It is constructed with a substantial steel framework and heavy steel plate shell. Chamber opening is framed in heavy cast iron sections to give added strength and resistance to heat at this point. Combustion chamber walls are of high quality firebrick and insulated.

A special feature is the suspended type arch. Standard arch shapes suspended from upper framework can be easily replaced when burned out under service and any section of that arch can be replaced without disturbing the rest of the arch. This repair can be handled by unskilled labor when bricklayers are not readily available.

Either oil or gas burners can be supplied. For swaging, at operating temperatures of 1750 to 1800° F., a furnace of 27" x 9" x 7½" rated size is used and for annealing at 1400 to 1500° F., a furnace of 18" x 6" x 7½" rated size is used. Many railroad shops know how well this rugged MAHR unit stays on the job and turns out the work.

Ask for complete information on the MAHR Open Side Special R.R. Type Furnace, or other types as listed for ANY heat treating process. MAHR makes 'em all! —backed by a 25 year record of successful achievement.

MAHR
ENGINEERS • DESIGNERS • MANUFACTURERS
ALL EQUIPMENT FOR METAL HEATING

Other MAHR Products for Railroads:

Stress Relief Furnaces	Locomotive Fire Lighter	Crucible Furnaces
Hand Torches	Locomotive Tire Heater	Tool Furnaces
Preheating Torches	Rivet Forges	Oil and Gas Burners
Paint Burning Torches	Forging Furnaces	Low Pressure Blowers
		Valves
		Ladle Heaters

Babbitt Furnaces—Pot, Portable, Stationary

Sales Offices in Principal Cities

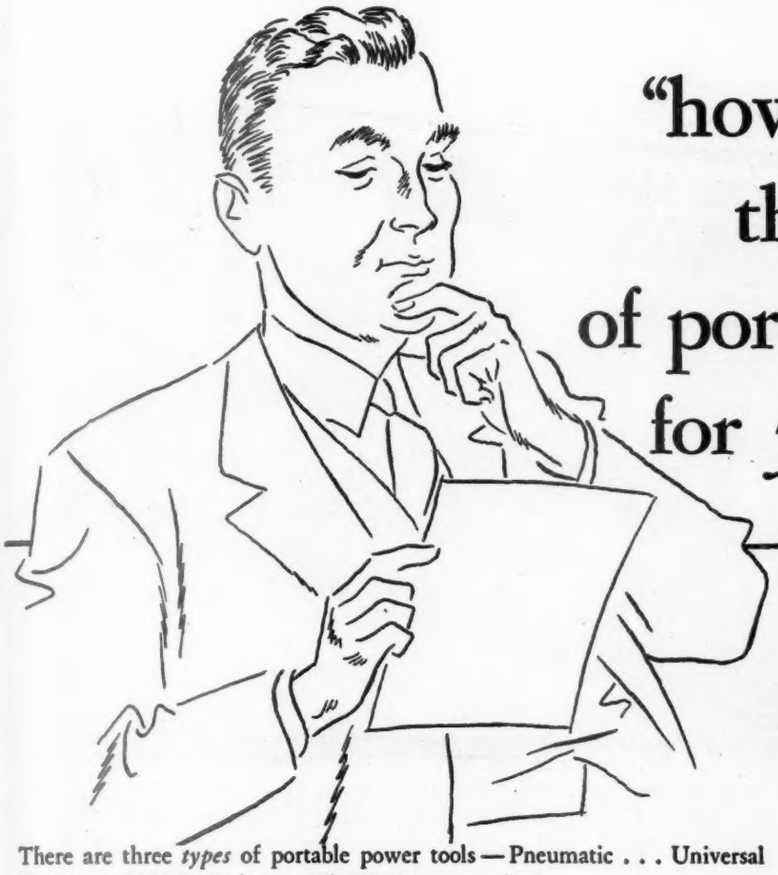
MAHR MANUFACTURING CO.

DIVISION OF DIAMOND IRON WORKS, INC.

1710 NORTH SECOND STREET • MINNEAPOLIS, MINNESOTA, U. S. A.

★ *Save ALL your scrap!* ★

★ *Buy MORE War Bonds!* ★



"how to determine the right type of portable power tools for *your* operations"

There are three *types* of portable power tools — Pneumatic . . . Universal Electric and High Frequency Electric.

Each has certain basic design, construction and operating characteristics which make it particularly suitable for certain operating conditions. Broadly, the factors which govern the selection of proper tools are: the *nature* of the work; the *amount* of work; the *material* to be worked and the *service* expected of the tools.

All types of portable tools will help you speed production; *one* type, selected for its particular adaptability to your applications and operating methods, will bring you PEAK production.

THOR is especially well qualified to help you determine which type this is, because:

Thor makes all three types of portable power tools.

Thor has the engineering "know how" that comes from building good tools for fifty years.

Thor is working continuously to make the good tools of today even better tools tomorrow . . . to develop new tools for new applications.

Thor has the trained Service Engineers to put this advisory service into practical operation.

A competent study of your conditions and an *impartial* recommendation of your requirements — including dependable cost estimates and comparisons — will be gladly furnished without obligation. Your inquiry will bring a Thor engineer quickly. Write to the Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Illinois.

BASIC ADVANTAGES
of the Three Types of Portable Power Tools

Pneumatic Tools

Available for a wider variety of applications than any other type.

Generally of more rugged construction.

Cannot be damaged by overloading.

Easily stand up under the hardest kinds of heavy duty service.

Universal Electric Tools

Run on ordinary AC or DC electric current which is available almost everywhere.

Offer a wide range of models for all kinds of production and maintenance.

Installation costs generally lowest of all.

High Frequency Electric Tools

Lowest operating costs for users of ten or more tools.

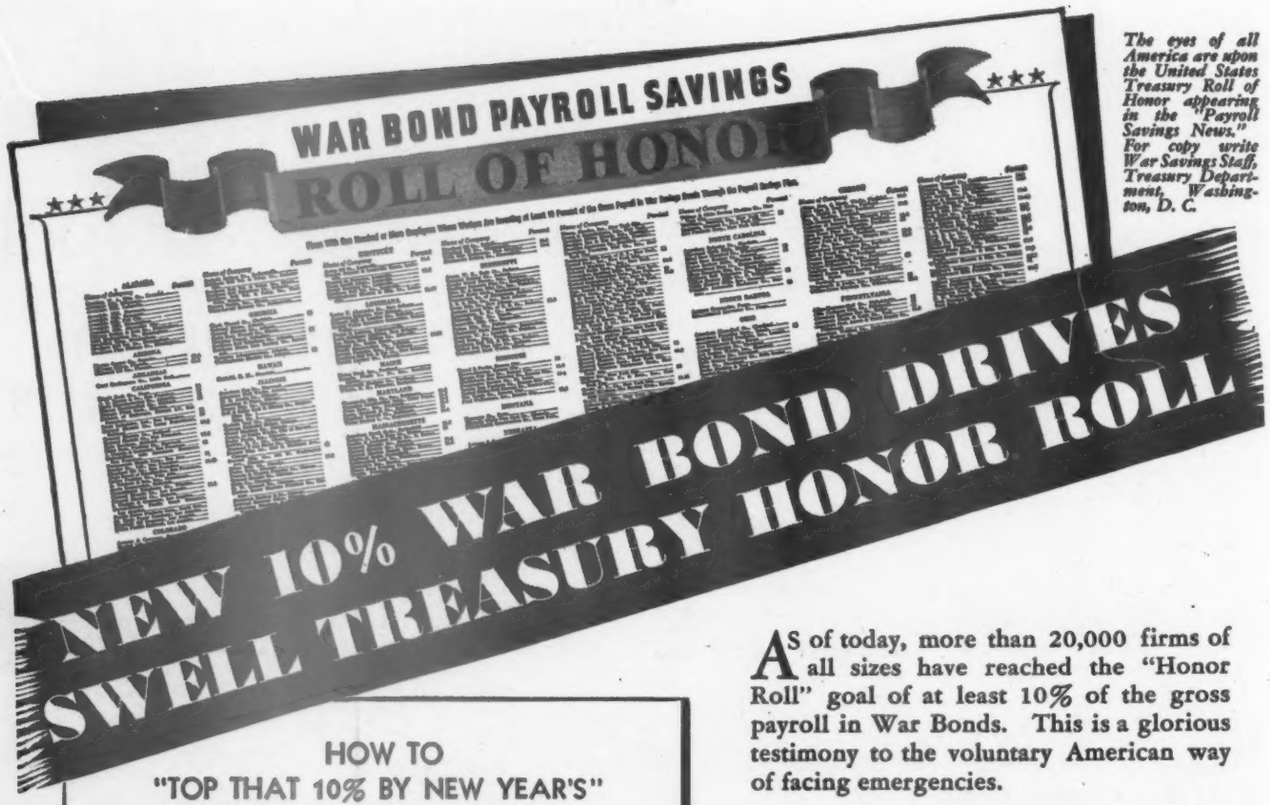
Maintain virtually constant speed under load.

Nature of high frequency current permits simplified construction for light weight, easy handling, reduced maintenance.

Thor
PORTABLE TOOLS

PNEUMATIC • UNIVERSAL ELECTRIC • HIGH FREQUENCY ELECTRIC

Let Thor help you get peak production with the right type of Portable Power Tools



The eyes of all America are upon the United States Treasury Roll of Honor appearing in the "Payroll Savings News." For copy write War Savings Staff, Treasury Department, Washington, D. C.

HOW TO "TOP THAT 10% BY NEW YEAR'S"

Out of the 13 labor-management conferences sponsored by the National Committee for Payroll Savings and conducted by the Treasury Department throughout the Nation has come this formula for reaching the 10% of gross payroll War Bond objective:

1. ***Decide to get 10%.***
   It has been the Treasury experience wherever management and labor have gotten together and decided the job could be done, the job was done.
2. ***Get a committee of labor and management to work out details for solicitation.***
   a. They, in turn, will appoint captain-leaders or chairmen who will be responsible for actual solicitation of no more than 10 workers.
   b. A card should be prepared for each and every worker with his name on it.
   c. An estimate should be made of the possible amount each worker can set aside so that an "over-all" of 10% is achieved. Some may not be able to set aside 10%, others can save more.
3. ***Set aside a date to start the drive.***
4. ***There should be little or no time between the announcement of the drive and the drive itself.***
   The drive should last not over 1 week.
5. The opening of the drive may be through a talk, a rally, or just a plain announcement in each department.
6. Schedule competition between departments; show progress charts daily.
7. Set as a goal the Treasury flag with a "T."

AS of today, more than 20,000 firms of all sizes have reached the "Honor Roll" goal of at least 10% of the gross payroll in War Bonds. This is a glorious testimony to the voluntary American way of facing emergencies.

But there is still more to be done. By January 1st, 1943, the Treasury hopes to raise participation from the present total of around 20,000,000 employees investing an average of 8% of earnings to over 30,000,000 investing an average of at least 10% of earnings in War Bonds.

You are urged to set your own sights accordingly and to do all in your power to start the new year on the Roll of Honor, to give War Bonds for bonuses, and to purchase up to the limit, both personally and as a company, of Series F and G Bonds. (Remember that the new limitation of purchases of F and G Bonds in any one calendar year has been increased from $50,000 to $100,000.)

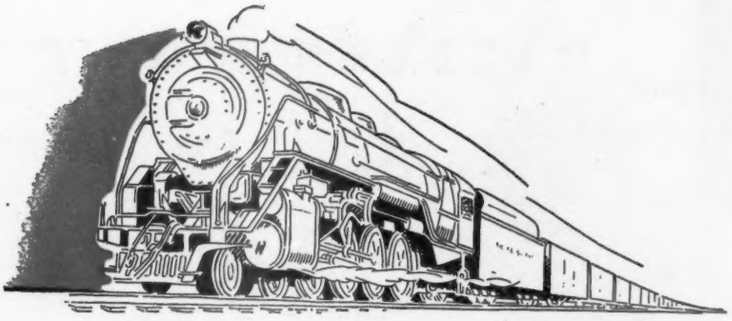
TIME IS SHORT. Our country is counting on you to—

"TOP THAT 10% BY NEW YEAR'S"

EVERYBODY EVERY PAYDAY AT LEAST 10%

Save with
War Savings Bonds

This space is a Contribution to America's All-Out War Effort by RAILWAY MECHANICAL ENGINEER



Every new locomotive that is equipped with Timken Bearings * * * * * * * * * * * *

Will save (For 4-8-4 type Steam locomotive) 2,438 pounds of copper and 218 pounds of tin, both of which are now so badly needed for other essential war materials * *

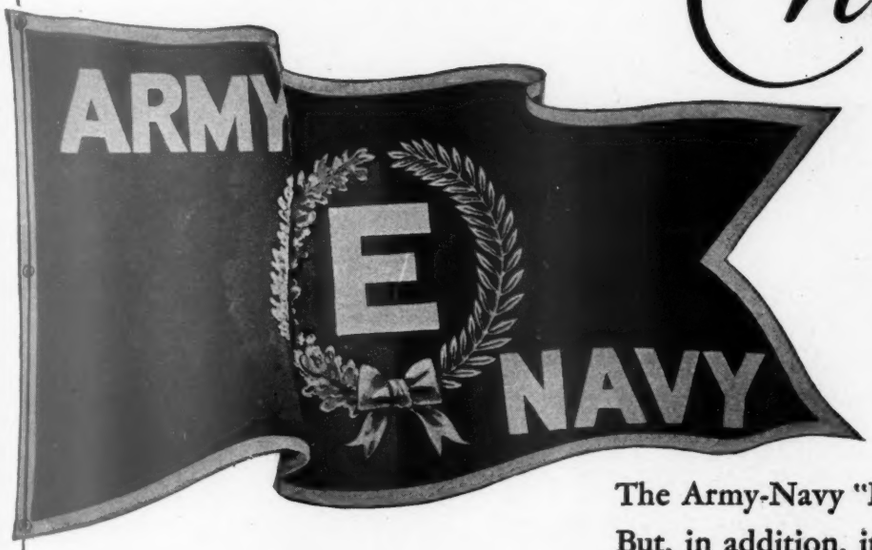
And will make possible a 75% increase in locomotive availability. (Averaged records of 6 railroads show that 4 Timken Bearing Equipped locomotives will do the work of 7 similar Friction Bearing locomotives) * *

These same important war-time savings are also available for existing locomotives by converting them to Timken Bearings * * * *

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
RAILWAY ROLLER BEARINGS

WE ACCEPT THE *Challenge*



The Army-Navy "E" is a symbol of a job well done. But, in addition, it is a challenge.

To us, that challenge means that we must continue to supply the high-quality I-R pneumatic tools that are needed by essential industries at home and our combat units abroad.

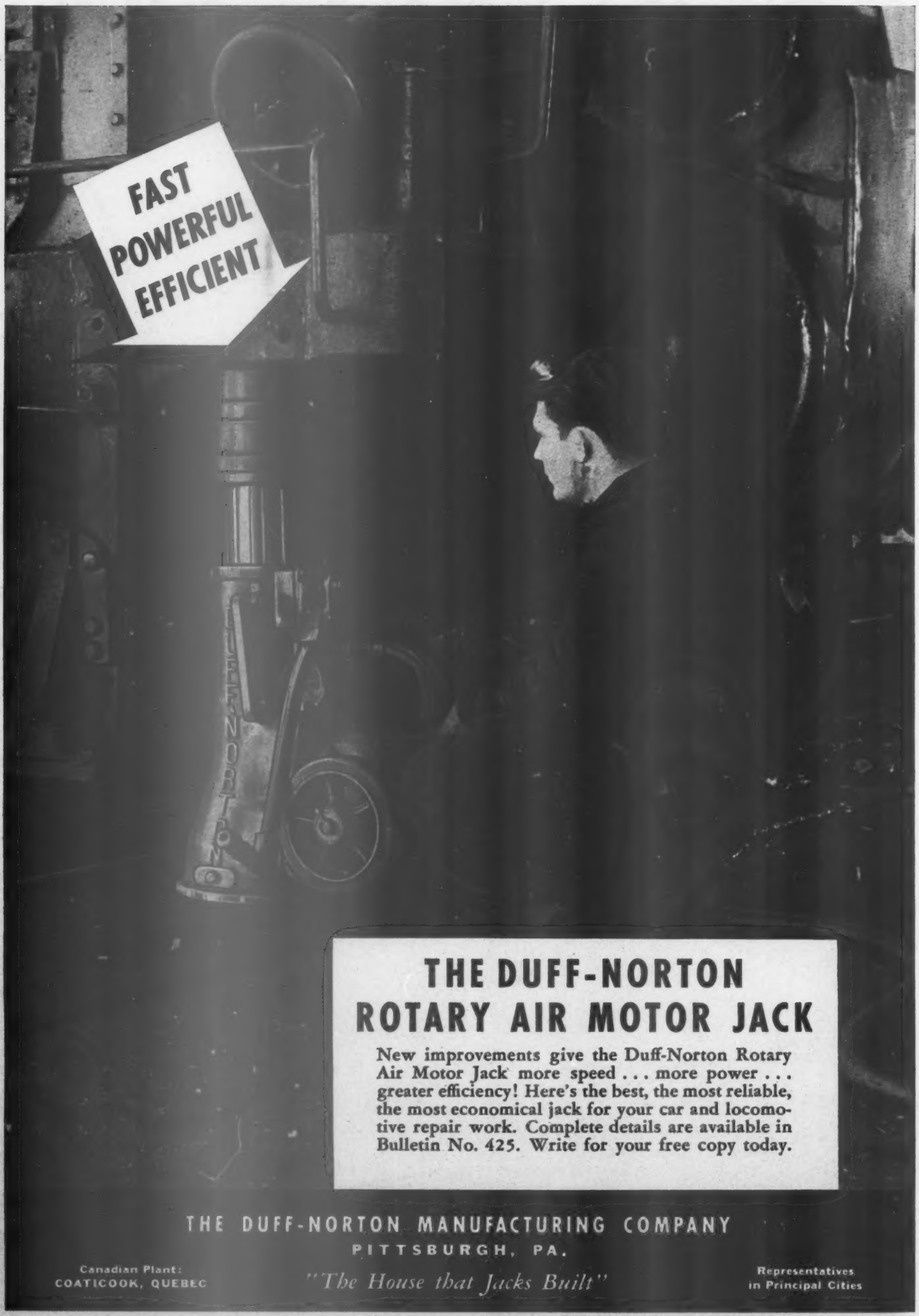
For high achievement in supplying essential war equipment, our Athens plant was awarded the Army-Navy "E" on July 22, 1942. We are proud to be among the first to receive the burgee, and we accept its responsibilities.

AIR TOOLS

Ingersoll-Rand
11 BROADWAY, NEW YORK, N. Y.

8-214

Air Motors
Air Motor Hoists
Caulking Hammers
Chipping Hammers
Concrete Vibrators
Drills
Grinders
Hoists
Nut-Runners
Rivet Busters
Riveting Hammers
Sand Rammers
Scaling Tools
Spades & Diggers
Sump Pumps
Tampers
Weld-Flux Scaler
Wood Borers
Impact Wrenches



THE DUFF-NORTON ROTARY AIR MOTOR JACK

New improvements give the Duff-Norton Rotary Air Motor Jack more speed . . . more power . . . greater efficiency! Here's the best, the most reliable, the most economical jack for your car and locomotive repair work. Complete details are available in Bulletin No. 425. Write for your free copy today.

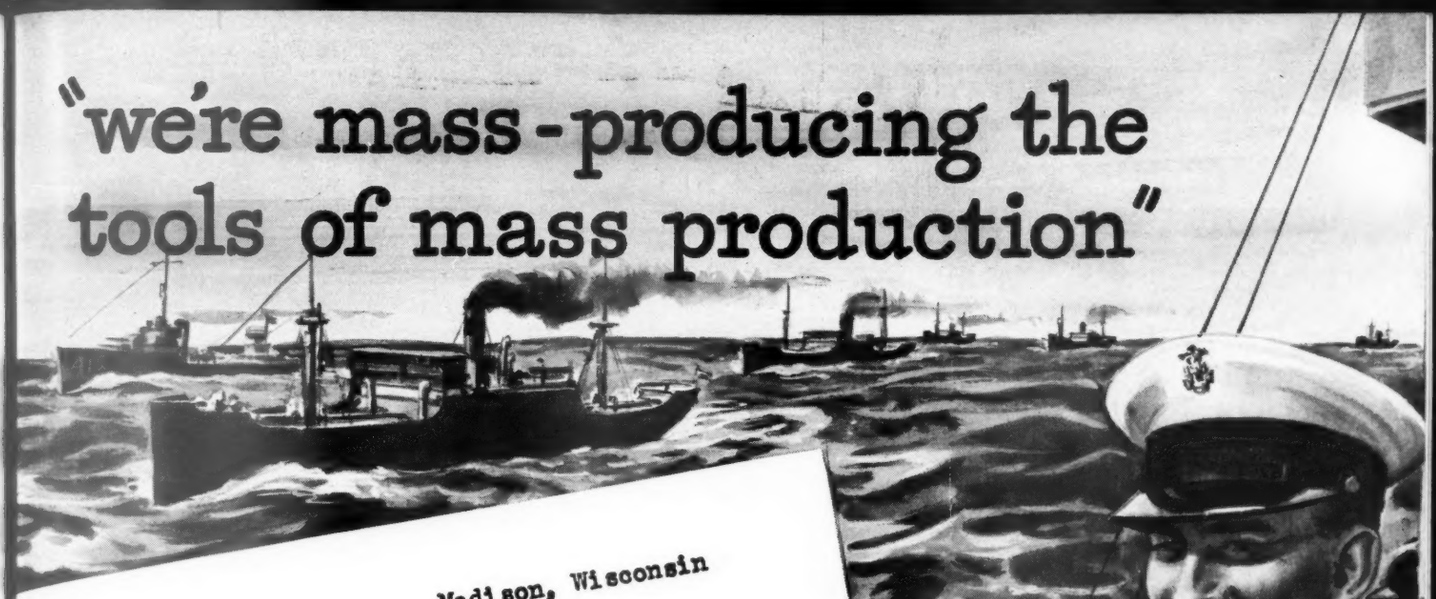
THE DUFF-NORTON MANUFACTURING COMPANY
PITTSBURGH, PA.

Canadian Plant:
COATICOOK, QUEBEC

"The House that Jacks Built"

Representatives
in Principal Cities

"we're mass-producing the tools of mass production"



Madison, Wisconsin

ear "Admiral":

Perhaps out there at sea you often wonder what we're doing back home. Wish you could see for yourself. You'd hardly know the old place.

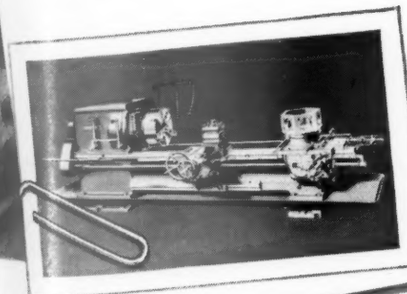
It would do your heart good to see our production line for the new "Victory" lathes. Here's a good example of the way American engineers can meet an emergency like this! Actually, you could say that we're mass-producing the tools of mass production! We're building these big turret lathes 15 times faster than our former peak capacity in these sizes!

How'd we manage to do it? Maybe the censors wouldn't like to have us put the whole story in writing. But take our word for it, there'll be no "aid and comfort" for the enemy in the number of them that are going to work in vital war plants!

One thing you can count on: this country is going to out-produce the Axis by a wide margin. We're "all out" to end this war as soon as possible. And when it's over, we hope you can be as proud of the home folks as they are of you.

Salutes!

The fellows at Gisholt



These new Victory lathes are big Saddle Type machines: Two sizes: 21" and 24" chucks; 5¼" and 9¼" spindle bores.

GISHOLT

THIS letter may be good news to any man in the fighting forces. But it's even more to the point for the man trying to increase production capacity in vital war plants.

Proper Welding Accessories and Increase Production

Select yours from this new G-E catalog — — — describes and illustrates more than 100 items

THIS new 32-page G-E catalog is more than a mere listing of products—it is a complete, up-to-the-minute reference book on all important arc-welding accessory items. Profusely illustrated throughout, it contains a wealth of important information.

Designed for quick, easy reference, this catalog contains complete, detailed descriptions of every standard accessory used by arc-welding operators. Full buying specifications, prices, and four sets of convenient order blanks are also included.

Proper arc-welding accessories do more than assure safe, comfortable operation—they help speed up production by providing better working conditions and reducing the time lost in making adjustments of equipment.

For this reason, every operator, every supervisor and foreman, should study this new G-E catalog carefully. For your copy, simply ask your G-E arc-welding distributor or local G-E office for GEA-2704B, or use coupon on opposite page.

ARC-WELDING ACCESSORIES FOR WOMEN is the title of another new G-E catalog which describes and illustrates a complete line of helmets and handshields, electrode holders, and protective clothing particularly suited for women. For your copy, contact your G-E arc-welding distributor or local G-E office and ask for GEA-3295, or use coupon on opposite page.

Promote Safety

HELMETS AND HANDSHIELDS—
many different types, including the popular G-E ventilated head protectors.

WELDING LENSES AND COVER GLASS—
four standard shades of welding lenses and both treated and untreated cover glass.

PROTECTIVE GOGGLES—
specially designed to protect the eyes against flying slag particles and flashes from other arcs while the helmet is raised.

PROTECTIVE CLOTHING—
made of five-ounce chrome leather for comfort and safety. Aprons, pants, jackets, coats, overall, sleeves, gloves and mittens.

ELECTRODE HOLDERS—
eight selected types of metal electrode holders to meet every need; three types of carbon electrode holders.

BRUSHES AND CHIPPERS—
a number of different styles, including the widely used G-E combination slag chipper with steel brush.

WELD-SPATTER RESISTANT—
an easily-applied liquid that prevents the adhesion of weld spatter.

MISCELLANEOUS—
cable connectors, welding clamps, electrode carriers, arc-welding cable, weld gage, ultra-violet-ray protective paint, etc.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment

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GENERAL ELECTRIC, Section R673-44
Schenectady, N. Y.

Please send me, without obligation, the catalog checked below

☐ Arc-welding Accessories, GEA-2704B

☐ Selected Arc-welding Accessories for Women, GEA-3295

ORGANIZATION _____

YOUR NAME _____

ADDRESS _____

CITY _____ STATE _____

GENERAL ELECTRIC

HERE'S TIMELY HELP

for your date with Old Man Winter!

COPIES OF BOTH THESE CHECK LISTS AVAILABLE ON REQUEST

HANDY SERVICE TAG TIED TO EQUIPMENT reminds service men of inspections and simplies procedure.

SIMPLIFIED MAINTENANCE GUIDE FOR SHOP WALL lists the most vulnerable parts and the best methods of servicing them.

STURTEVANT PROGRAM

simplifies cold weather care of air conditioning... prolongs life of equipment!

Winter means plenty of work for your air conditioning maintenance men... work that must be done with a minimum of time and trained man-power. And we consider it our duty and obligation to do everything possible to help you.

So, to assist the American Railroads maintain efficient and uninterrupted service of air conditioned cars, Sturtevant is:—

Continuing emergency repair of equipment which you are unable to service in your own shops.

Offering the helpful maintenance charts and equipment tags shown, that simplify and standardize the most important jobs.

Keeping our Railway Air Conditioning Engineers on call for any further help you need.

For these days of general overhaul, and final preparation for winter operation: Old equipment must be checked and put into condition to run for another season. To prevent loss, most of the Freon should be pumped into receiver for storage, isolating the compressor but leaving about one pound pressure in the system. Belts should be removed, cleaned and stored; heater coils cleaned and fan inlet covered. To check up on these and other vital jobs, to see that each unit is cared for properly and promptly, make sure that your men have a supply of the Sturtevant Equipment Tags and Wall Charts. We will send the quantities of each you require by return mail. No obligation, of course.

Railway Air Conditioning Division
B. F. STURTEVANT CO., HYDE PARK, BOSTON, MASS.

Sturtevant
REG. U. S. PAT. OFF.
Puts Air to Work

GET TOGETHER DEPARTMENT

FOR SALE

Have You Changed Your Address?

Notice of change of address of subscribers should reach the office of *Railway Mechanical Engineer*, 30 Church St., New York, ten days in advance to insure delivery of the following issue to new address. In sending notification of change always include the old address as well as the new.

Name .....

Old Address .....

New Address .....

Position .....**Company** .....

THE EDITOR'S DESK

YEAR-END MUSINGS

At long last the tide is turning and the Allies are taking the offensive on all fronts. It is true that a tremendous task yet remains to be done and that it will undoubtedly entail great sacrifices on the part of all our people. Nevertheless, a suffering world is greatly heartened by the new turn of events.

We are now beginning to see the results of the successful mobilization of a great war machine by the Allies, including the production of war supplies and armament on a really gigantic scale. The railways of this country and Canada have acquitted themselves magnificently, with a minimum of new equipment and facilities. All records in handling traffic have been broken and the prospects are that a still greater amount must be moved during the coming year.

Director Eastman of the ODT and President Pelley of the AAR have both pleaded earnestly for more new equipment and for adequate materials with which to maintain the equipment and facilities now in service. Railroaders were not particularly well pleased with the announcement of the proposed release of material for new equipment during the first quarter of 1943, but are hopeful of receiving more consideration later on. Even if some of the optimists prove right and Hitler is crushed next year, the railways will still have to handle a record business during the reconstruction period, and while war continues to be waged in the Far East. For this they must be adequately equipped.

The railroads are not now getting all the materials and equipment they believe necessary, because those responsible feel that other requirements are more pressing and that the railroads can continue to carry on successfully, with reduced services to civilians.

The powers that be have been none too friendly to the railroads over the years. It will be too bad if now when the roads are making such a splendid contribution to our nation's war activities, our people should resent inconveniences to which they may be subjected and over which the railroads have no control because of the lack of equipment.

Now is the time for every railway employee to do his full part, not only in facilitating the movement of traffic, but also in helping to educate the public about the part the railroads are playing to help win the Victory. Every employee should also be on the alert to extend whatever courtesies possible to the public and to cultivate more cordial public relations. This will mean much to the railroads when peace returns and conditions become more normal.

Roy V. Wright

Information supplied by National Fire Protection Association

The surest way of preventing cutting and welding fires is to keep flames, sparks, molten slag and hot metal away from flammable materials. This elementary precaution is the most often ignored.

There are other precautions which, if observed, will do much to prevent cutting fires.

1. Always check fire hazards in new locations before starting work.
2. Have precautions in individual cases specified by responsible authority.
3. Move combustible material at least 30 to 40 feet away from cutting operation.
4. Sweep floors clean before lighting the torch.
5. If combustible material cannot be moved, or if sparks or slag may lodge in wooden structures, or drop through pipes or holes to floor below, use sheet metal guards, asbestos paper or curtains to localize flying sparks or slag.
6. Before cutting steel or iron be sure that it will not drop on combustible material.
7. When finished check surroundings thoroughly to make sure *all* smouldering sparks are put out.

FOAM-FREE . . .

thanks to Dearborn's non-saponifiable Anti-Foam

Water is taken on from a troublesome supply. But to the water, the engineman is adding the new Dearborn anti-foam in powdered form. He knows his foaming troubles in this bad water district are over. He also knows that he can run into the next district, in which the water is not troublesome, without contamination, holding the concentration down by regular blowoff to a point where the water will not foam. This new anti-foam does not form residual soap in the locomotive boiler to foam up later in districts where the water does not have to be treated.

Thus by using this new anti-foam, which acts as a leveler, locomotives can run from a troublesome water district into a non-troublesome water district without cleaning the boiler or changing the water in the tender tank.

Dearborn new anti-foam is substantially non-saponifiable and non-hydrolyzable in alkaline boiler waters. It has an effective life many times that of any available organic anti-foam material, providing a flexibility of locomotive operation that is so desirable these days.

The Dearborn Engineer in your territory will gladly demonstrate this new anti-foam to you.

DEARBORN CHEMICAL COMPANY
310 South Michigan Avenue, Chicago, Illinois
205 E. 42nd Street, New York
2454 Dundas St., West, Toronto
807-15 Mateo St., Los Angeles

POWDER . . . TO BE SURE

In this form it can be added to the tender tank without previous mixing. It is super-pulverized to assure finest dispersion of active ingredients, without sifting out. Chemicals retain their most effective form throughout a large volume of water such as in a locomotive boiler without agglomeration.

LIQUID . . . for mechanical application at wayside stations.

PASTE . . . also for mechanical application at wayside stations.

BRICK . . . for manual or mechanical application at wayside stations.

Dearborn

TRADE MARK REGISTERED

TREATMENT

BULLARD R.R. Shop UNITS

Behind the Lines

ON THE TRANSPORTATION FRONT

EVERY locomotive repair shop is playing a vital part in keeping the guns tanks, planes, munitions and vital supplies rolling to the front lines on schedule.

The supervisory forces, machine operators and men on the erecting floor deserve nationwide recognition for the splendid job that they are doing.

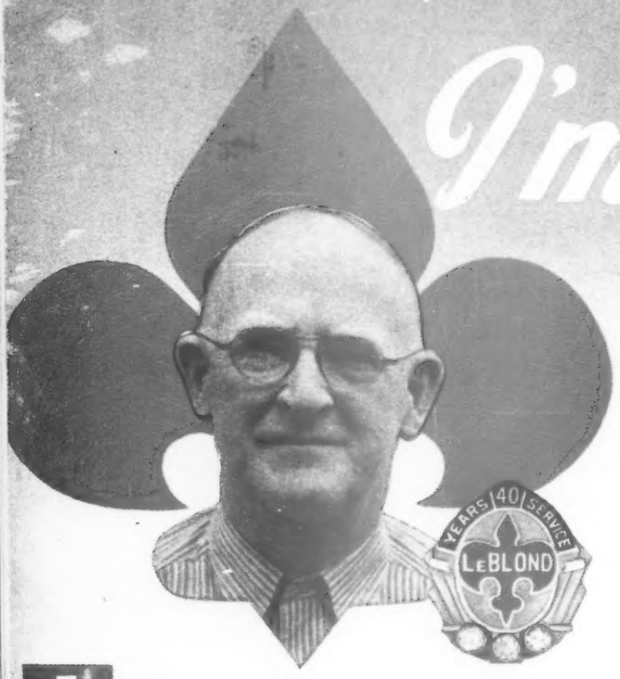
Bullard R. R. Shop Units will be found in service in most of the leading railroad back shops. Their production helps to speed classified repairs and keep power on the road, rolling supplies to Victory.

In spite of the tremendous burdens imposed on the staff by the requirements of war industries, BULLARD engineers find time to keep in touch with the boring and turning problems in locomotive repair shops. They are always ready to assist in preparation of plans for railroad shop modernization.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

I'm Tellin' You...

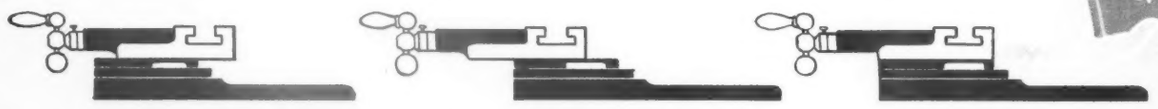


No. 4 in a series of tips on "Keeping 'em Turning"

by ***George Whitehouse, 41 years at LeBlond's***

Lots of new lathe hands figure that rough turning is a kind of hacking process that doesn't call for much brain work. It's probably true that roughing isn't as much of a trick as finishing, but there are some important do's and don'ts. Here's some dope that you will want to remember.

1 POSITION OF COMPOUND REST FOR ROUGH CUTTING



This is wrong. Slide overhangs too far to right. Might break in middle of tee slot.

This is wrong, too. Slide overhangs to left. Also could break in middle of tee slot.

This is right. When making heavy cuts, top slide should be flush with bottom slide so all metal is in compression.

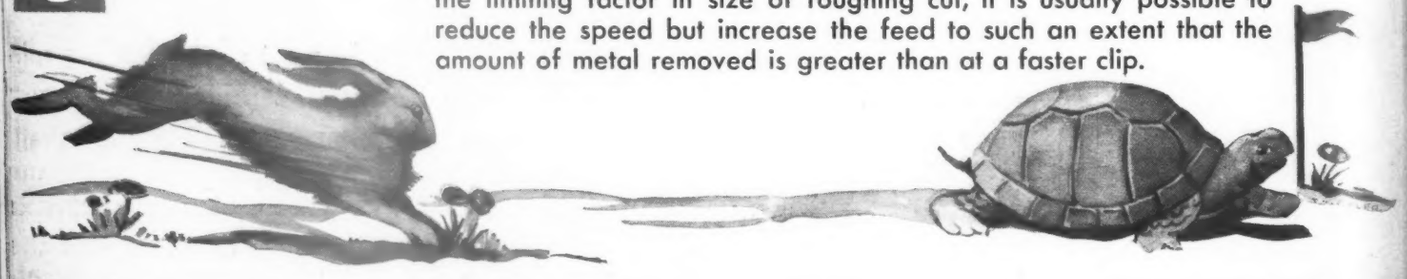
2 CUTTING SPEEDS

KIND OF MATERIAL	CUTTING SPEED Ft. per Min.	DEPTH OF CUT Inch.	RATE OF FEED Per Rev.
CAST IRON	210	3/8	0.062
SEMI-STEEL	280	1/8	0.012
TOOL STEEL	140	1/2	0.020
BRONZE	425	3/16	0.024
BRASS	458	3/32	0.108
ALUMINUM ALLOY	570	1/8	0.031

When using carbide type tools, these figures are as good as any for a general guide. The rigidity of the machine and tool support, interrupted cuts, etc., will make experimentation and adjustments desirable.

3 SLOW DOWN AND FINISH SOONER . . . .

There is a tendency for many lathe operators to work their machine far below top efficiency because they fail to take a deep enough bite. Where tool failure is the limiting factor in size of roughing cut, it is usually possible to reduce the speed but increase the feed to such an extent that the amount of metal removed is greater than at a faster clip.



THE R. K. LeBLOND MACHINE TOOL COMPANY

CINCINNATI, OHIO

Largest Manufacturer of a Complete Line of Lathes

BRIDGEPORT, CONNECTICUT